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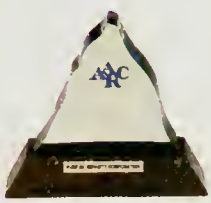

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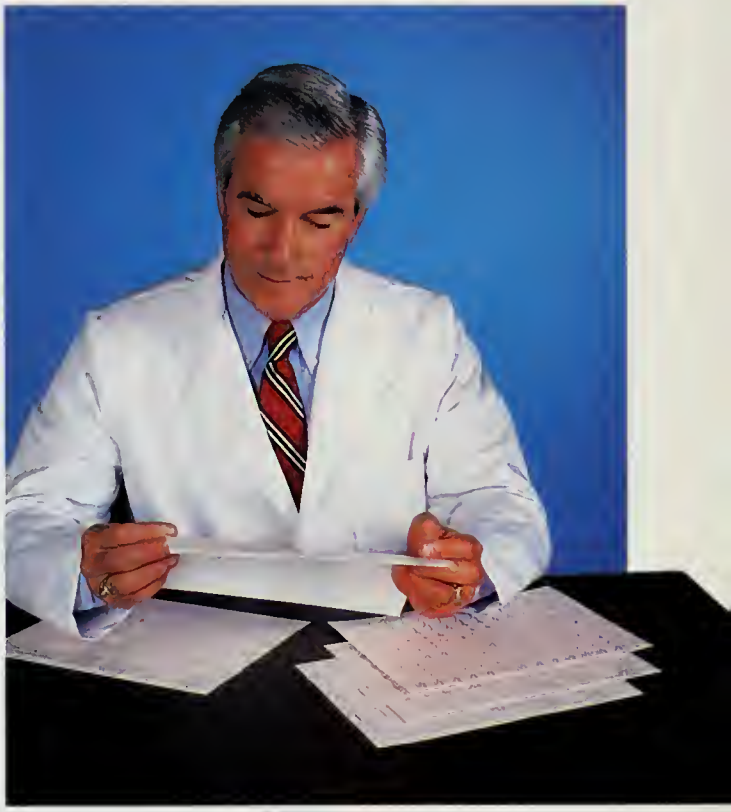

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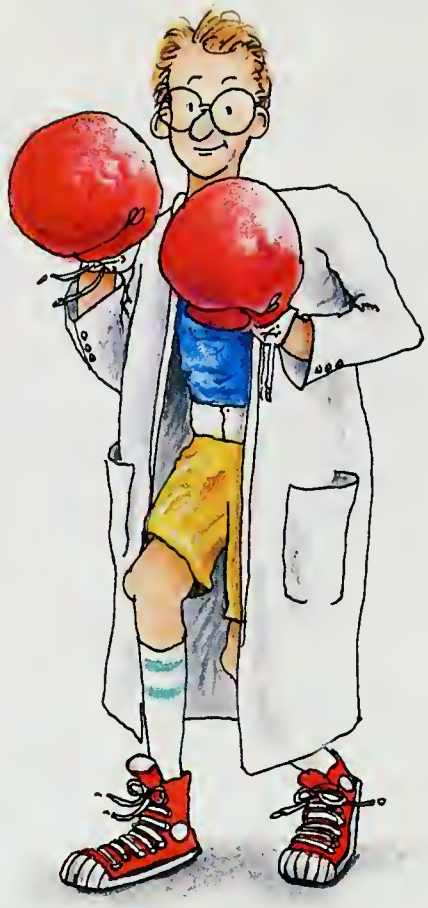

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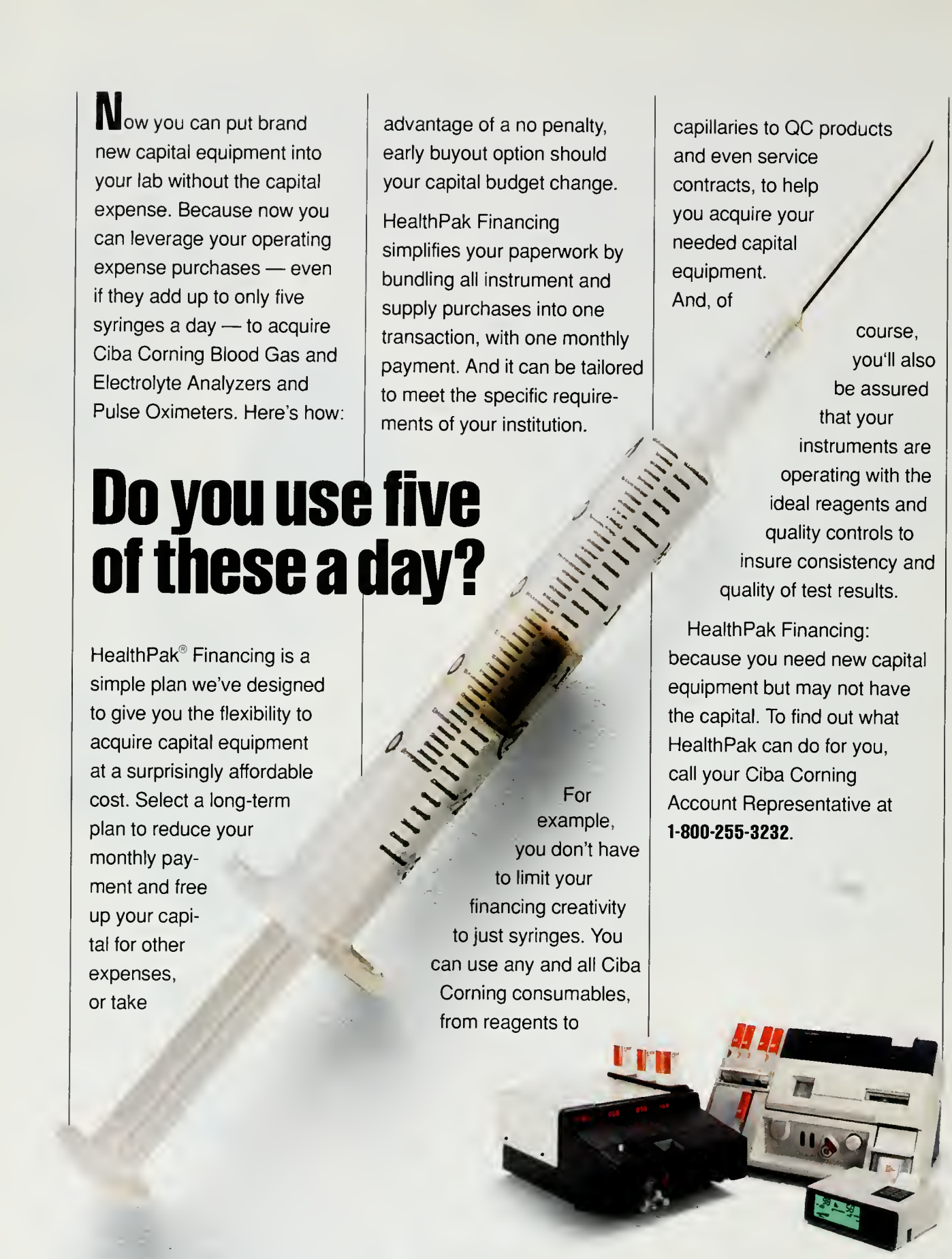

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"Recovery Only" ST-Segment Depression and the Predictive Accuracy of the Exercise Test—B Lachterman, KG Lehmann, D Abrahamson, VF Froelicher. Ann Intern Med 1990;112:11.

Study Objective: To clarify the predictive value of exercise-induced ST-segment depression occurring in recovery only, and to determine whether the addition of recovery data improves the interpretation of the exercise test. Design: Retrospective analysis of data collected during exercise testing and coronary angiography. Setting: A 100-bed Veterans Affairs Medical Center. Participants: The study included 328 male patients who had had both a sign- or symptom-limited treadmill test and coronary angiography. Measurements and Main Results: Of the 168 patients who had abnormal ST-segment responses, 26 had such responses only during recovery. The positive predictive value of this pattern for significant angiographic disease (84%) was not statistically different from the predictive value of ST depression occurring during exercise (87%). Inclusion of ST depression during recovery significantly increased the sensitivity of the exercise test from 50% to 59% ($p = 0.01$) without a change in predictive value. In addition, ST-segment depression occurring only during exercise is usually associated with less-severe angiographic coronary artery disease. Conclusion: The occurrence of ST-segment depression during the recovery period only, does not generally represent a "false-positive" response. The inclusion of findings from this period increases the diagnostic yield of the exercise test. Previously proposed exercise test scores, as well as exercise electrocardiography (ECG) analysis done in conjunction with scintigraphy, have a falsely lowered sensitivity that could be increased by considering ST-segment changes occurring in recovery.

The National Mucolytic Study: Results of a Randomized, Double-Blind, Placebo-Controlled Study of Iodinated Glycerol in Chronic Obstructive Bronchitis—TL Petty. Chest 1990;97:75.

Seventy-four pulmonologists and one allergist were recruited to assess the efficacy and safety of iodinated glycerol (Organidin), 60 mg qid, vs placebo in patients with stable chronic obstructive bronchitis in a randomized, double-blind, placebo-controlled, parallel design. A total of 361 patients (180 to iodinated glycerol and 181 to placebo) who complained of cough and difficulty bringing up sputum entered the 8-week study. Evaluations were based upon eight primary symptom efficacy parameters (cough frequency, cough severity, chest discomfort, dyspnea, ease in bringing up sputum, patient and physician global assessments, and a derived patients' global assessment) and six secondary parameters (frequency of aerosol bronchodilator use, incidence and duration of acute exacerbations, frequency of concomitant medication use, incidences of adverse experiences and dropouts). Cough frequency, cough severity, chest discomfort, patients' ease in bringing up sputum, patients' overall condition, and a derived subject global assessment were significantly ($p < 0.05$) improved by iodinated glycerol as compared with placebo within 8 weeks of treatment. Dyspnea showed a trend toward improvement and the physicians' global evaluation showed no significant difference between groups. Similar findings were noted in a subgroup analysis of moderately-to-severely affected patients. The mean duration (days) of acute exacerbations and number of dropouts attributable to adverse experiences were significantly less ($p < 0.05$) in the iodinated glycerol group. The efficacy and safety of iodinated glycerol, given as adjunctive therapy, was shown in a well-defined group of patients with chronic obstructive bronchitis; it improved cough symptoms, chest discomfort, ease in bringing up sputum, and patient well-being, as well as decreased the duration of acute exacerbations of chronic bronchitis.

Plasma DNA: A Simple, Rapid Test for Aiding the Diagnosis of Pulmonary Embolism—JS Vargo, DM Becker, JT Philbrick, FW Schoonover, JS Davis. Chest 1990;97:63.

Previously, we reported that the sensitivity of plasma DNA for patients with pulmonary emboli was 83 to 88%. To confirm these findings in a more comprehensive study, we collected plasma samples from 137 consecutive patients undergoing 148 ventilation-perfusion lung scans for pulmonary embolism. DNA was measured using a counterimmunoelectrophoresis technique that used high titer precipitating double-stranded DNA antibody from a patient with systemic lupus erythematosus. In addition to 17 patients (17 lung scans) excluded for not having plasma collected, 32 patients (37 lung scans) were excluded for having either a condition other than pulmonary embolism that could be associated with plasma DNA or for having nonacute symptoms. Eighteen of 22 patients with a diagnosis of pulmonary embolism (defined by either a high probability lung scan or abnormal pulmonary angiogram) had detectable plasma DNA. Only four of 27 patients without pulmonary embolism (defined by either a normal lung scan or normal

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pulmonary angiogram) had plasma DNA detected. Based on these results, plasma DNA had a sensitivity of 85% and a specificity of 85% for this condition. Plasma DNA is a promising test for pulmonary embolism and could help physicians interpret equivocal lung scan findings and thereby clarify difficult decisions such as the need for pulmonary angiography.

Interferon Alfa, Infectious Virus, and Virus Antigen Secretion in Respiratory Syncytial Virus Infections of Graded Severity—CE Taylor, MSC Webb, AD Milner, et al. Arch Dis Child 1989;64:1656.

Interferon alfa was measured by an immunoradiometric assay in the nasopharyngeal secretions of a group of infants admitted to the hospital with respiratory syncytial virus infection. Virus replication in the upper respiratory tract was assessed by infectivity assay and by an enzyme linked immunoadsorbent assay for the viral fusion protein on the same nasopharyngeal secretions. All infants were examined daily while in the hospital and allocated a score based upon a subjective assessment of the severity of their illness. There was no significant correlation between interferon, virus, or fusion (F) protein secretion and severity of illness or age of infant. It is concluded that poor interferon alfa secretion does not underlie the susceptibility of infants to severe infections with this virus.

Survival Trends for Patients with AIDS—GF Lemp, SF Payne, D Neal, T Temelso, GW Rutherford. JAMA 1990;263:402.

To evaluate trends in the length of survival for patients with acquired immunodeficiency syndrome, we calculated survival following diagnosis of acquired immunodeficiency syndrome for 4,323 cases reported in San Francisco, California, between July 1981 and December 31, 1987. Patients were followed up prospectively through December 31, 1988. The median survival for all patients was 12.5 months, with a 5-year survival rate of 3.4%. Significantly improved survival was observed for patients diagnosed with *Pneumocystis carinii* pneumonia in 1986 and 1987. Survival for patients diagnosed with Kaposi's sarcoma declined significantly between 1981 and 1987. Survival was unchanged among patients diagnosed with other opportunistic infections or malignancies. Proportional hazards analyses indicated that initial diagnosis, age, and year of diagnosis were significant predictors of survival. For a subset of patients (n = 644), therapy with zidovudine was an additional significant predictor of survival. This study suggests that survival following diagnosis of acquired immunodeficiency syndrome has improved in recent years, primarily among patients with *carinii* pneumonia. Therapy with zidovudine may be partially responsible for these recent improvements.

Improved Short-Term Survival of AIDS Patients Initially Diagnosed with *Pneumocystis carinii* Pneumonia, 1984 Through 1987—JE Harris. JAMA 1990;263:397.

I analyzed trends in the survival of 36,847 adults who were diagnosed with acquired immunodeficiency syndrome between January 1984 and September 1987 under the pre-1987 surveillance definition of acquired immunodeficiency syndrome. For patients in whom *Pneumocystis carinii* pneumonia was among the first manifestations of acquired immunodeficiency syndrome, the estimated 1-year survival increased from 42.7% for those diagnosed in 1984 and 1985 (95% confidence interval, 41.5%-44.3%) to 54.5% for those diagnosed in 1986 and 1987 (95% confidence interval, 53.7%-55.7%). The gain in survival was observed in homosexual men and intravenous drug users of both sexes, in all age and racial groups, in all geographic regions, and in patients with and without coexisting initial diagnoses. Reduced mortality in the 3-month period immediately following the initial diagnosis of acquired immunodeficiency syndrome contributed little to the overall gain in survival. No gain in survival was seen for patients in whom *P carinii* pneumonia was not an initial manifestation of acquired immunodeficiency syndrome. It is unlikely that the observed improvements in survival resulted solely from errors in death reporting. Better diagnosis and treatment, particularly the introduction of zidovudine in 1986, may have contributed to the decline in mortality.

Bronchocutaneous Fistula in Dogs: Influence of Fistula Size and Ventilatory Mode on Airleak—L Gagnon, A Blouin, Y Cormier. Crit Care Med 1989;17:1301.

Bronchocutaneous fistula (BCF) can originate at different levels, from the major airways to the peripheral lung. Little is published on the influence of the fistula origin or the ventilatory effect of the airleak. This study evaluates relative CO_2 elimination via fistulas of various size and how different ventilatory modes influence both the quantity and quality, ie, oxygen and CO_2 content, of the airleak. We created BCF with five polyethylene tubings of different diameters (tube 1, 3.0 mm; tube 2, 4.0 mm; tube 3, 5.1 mm; tube 4, 6.4 mm; tube 5, 9.8 mm) in nine dogs. Six modes of ventilation were used with each tubing: spontaneous breathing (SB), pressure support (PS), high frequency (HF), assisted controlled with inspiration set at 20% (AC20) and at 67% (AC67) of the respiratory cycle, and AC20 with an end-expiratory pressure of +10 cm H_2O (PEEP). For each ventilatory mode, the fistula air flow ($\dot{V}_f$), CO_2,

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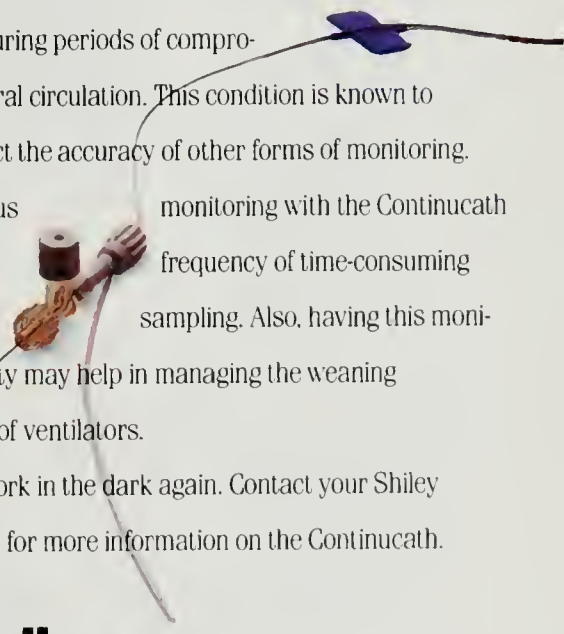

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and oxygen partial pressure of fistula air (P_{fCO_2} and P_{fO_2}) and arterial blood were measured. $\dot{V}_f$ was measured for all tubes, while gas analysis was done for tubes 1, 3, and 5 only. As expected, $\dot{V}_f$ increased with tubing size. $\dot{V}_f$ was higher with AC67 and PEEP than with the other ventilatory modes. P_{fCO_2} was not significantly influenced by the tube size and $\dot{V}_f$. Fistula air alveolization was increased only with HF ventilation. Air that leaked via the fistula contributed significantly to gas exchange; even when expiration was totally via the fistula, the arterial gases remained unchanged. We conclude that (a) ventilatory modes which increase airway pressures, such as PEEP and AC67, increase the fistula air flow; (b) the airway level of a fistula does not influence its major contribution to gas exchange; and (c) HF ventilation may increase the alveolization of air that is leaked through a fistula.

Prediction of Changing Cerebral Blood Flow by Use of the Conjunctival Oxygen Tension/Arterial Oxygen Tension Index—WF Rutherford, EA Panacek, JK Griffith, et al. Crit Care Med 1989;17:1328.

Current methods of assessing cerebral blood flow (CBF) are limited in their ability to provide data at the bedside in a timely, inexpensive, and continuous fashion. Since the palpebral conjunctiva is perfused by branches of the internal carotid artery, perfusion of this tissue may reflect global CBF. Conjunctival oxygen tension (P_{cjO_2}), P_{aO_2}, P_{aCO_2}, and pH were measured in ten healthy subjects during normal ventilation and active hyperventilation. CBF was measured simultaneously using positron emission tomography. CBF decreased from an average of 64.3 $\pm$ 15.1 mL/100 g $\cdot$ min^{-1} during baseline measurements to 33.2 $\pm$ 8.4 mL/100 g $\cdot$ min^{-1} during hyperventilation. The ratio of P_{cjO_2} to P_{aO_2} (the P_{cjO_2}/P_{aO_2} index) decreased from 0.53 $\pm$ 0.07 to 0.35 $\pm$ 0.09 in the same time period. The P_{cjO_2}/P_{aO_2} index was significantly correlated with CBF ($r = .78$, $p < .001$). We conclude that the P_{cjO_2}/P_{aO_2} index may reflect the reduction in CBF induced by hyperventilation in normal humans, and should be investigated further as a method of assessing CBF in other settings which can result in globally reduced cerebral perfusion.

Long-Term Follow-up of Nocturnal Ventilatory Assistance in Patients with Respiratory Failure Due to Duchenne-Type Muscular Dystrophy—CH Mohr, NS Hill. Chest 1990;97:91.

We followed eight patients with Duchenne-type muscular dystrophy for an average of 39 months after initiation of noninvasive intermittent ventilatory assistance using body ventilators. After 1-3 months of nocturnal use averaging 8 h, mean daytime P_{aCO_2} fell from 63 $\pm$ 2 to 45 $\pm$ 3 torr. At late follow-up, P_{aCO_2} remained stable at 47 $\pm$ 4 torr, but vital capacity fell 33% compared with the initial value, and the average duration of ventilator use had increased to 18 $\pm$ 2 h daily. Three patients died and five survived; two continued using negative pressure ventilators and three had tracheostomies placed for administration of positive pressure ventilation. We conclude that noninvasive intermittent ventilatory assistance effectively reverses hypoventilation and symptoms in patients with late-stage Duchenne muscular dystrophy, but pulmonary function continues to deteriorate necessitating longer periods of ventilation, and often tracheostomy, within a few years.

The Importance of Severity of Illness in Assessing Hospital Mortality—J Green, N Wintfeld, P Sharkey, LJ Passman. JAMA 1990;263:241.

Each year, the Health Care Financing Administration (HCFA) releases a report comparing hospital mortality rates with predicted rates. Some argue that the HCFA's prediction model does not adequately account for patient severity. We tested this hypothesis by comparing the HCFA's model (replicated as closely as we could) to a second that added a severity measure (the Stage of Principal Diagnosis at Admission, a subscale of the Severity of Illness Index). In our simulation, the HCFA's model had very limited capacity to predict mortality (average R^2, 2.5%). Patients grouped according to admission severity had markedly different mortality rates, which the HCFA's model's predictions could not differentiate. The HCFA model also failed to predict large differences in mortality between hospitals with low- and high-severity admissions. Adding severity to the HCFA's model yielded more than an eightfold increase in the R^2, to 21.5%, and reduced instances of higher than expected hospital mortality to chance levels. These findings suggest that the HCFA's mortality release needs to be made much more sensitive to admission severity before it can be used to make valid inferences about the quality or effectiveness of hospital care.

The Efficacy of an Oscillating Bed in the Prevention of Lower Respiratory Tract Infection in Critically Ill Victims of Blunt Trauma: A Prospective Study—MP Fink, CM Helsmoortel, KL Stein, PC Lee, SM Cohn. Chest 1990;97:132.

We tested the hypothesis that the incidence of lower respiratory tract infection (LRTI) in critically ill blunt trauma victims can be reduced by employing continuous postural oscillation. Within 24 h of admission to the SICU, 106 patients were prospectively randomized to either a conventional bed or a RRKTT. Seven patients

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who were discharged from the SICU in less than 24 h were excluded from the data analyses. Until discharge from the SICU, patients were monitored daily for development of LRTI or pneumonia. Among 48 patients in the control group, 28 met criteria for LRTI and 19 met criteria for pneumonia. Among 51 patients in the Roto-Rest kinetic treatment table (RRKTT) group, 13 developed LRTI and 7 developed pneumonia. The differences between groups for all LRTI and pneumonia were both significant. We conclude that continuous postural oscillation decreases the risk of pulmonary sepsis in victims of major blunt trauma.

Extracorporeal Membrane Oxygenation and Cerebral Blood Flow Velocity in Newborn Infants—M van de Bor, FJ Walther, ES Gangitano, JR Snyder. Crit Care Med 1990;18:10.

Doppler ultrasound was used to study cerebral hemodynamics in the pericallosal artery of 21 newborn infants undergoing extracorporeal membrane oxygenation (ECMO) for intractable respiratory failure. Cerebral blood flow velocity waveforms were obtained pre-ECMO, after every major change in cardiopulmonary bypass flow during ECMO, and post-ECMO. The mean pulsatility index (PI) pre-ECMO was slightly higher than after decannulation, secondary to hypocarbia pre-ECMO. The PI decreased significantly at high (61-120 mL/min kg) cardiopulmonary bypass flows. This was associated with an increase in mean arterial pressure, but not with changes in Hct, P_{aO_2}, or P_{aCO_2}. A negative curvilinear relationship between the amount of cardiopulmonary bypass flow and PI was found. These data suggest an increase in cerebral blood flow velocity and vasodilation of the cerebral vessels at high cardiopulmonary bypass flows, and may explain the occurrence of intracranial hemorrhage in infants undergoing ECMO.

Continuous Positive Airway Pressure by Face Mask in *Pneumocystis carinii* Pneumonia—RW Gregg, BC Friedman, JF Williams, BJ McGrath, JE Zimmerman. Crit Care Med 1990; 18:21.

We used continuous positive airway pressure (CPAP) by face mask to treat 18 AIDS patients with *Pneumocystis carinii* pneumonia (PCP) who were in hypoxic respiratory failure. Candidates for mask CPAP were conscious, not hypercarbic, and able to protect their airway on ICU admission. Treatment was effective and well tolerated. Mean P_{O_2} rose from 62 to 158 torr, respiratory rate decreased from 51 to 32 breath/min, and P_{CO_2} was unchanged. Mean duration of treatment was 4.5 days. Only one patient developed a pneumothorax; there were no other major complications. Hospital mortality was 55%. CPAP by face mask allows speech and permits discussion of therapeutic limits. We present our protocol for using CPAP by face mask and conclude that CPAP is effective supportive therapy in hypoxic respiratory failure complicating PCP and AIDS.

Vitamin E Deficiency and Lipoperoxidation during Adult Respiratory Distress Syndrome—C Richard, F Lemonnier, M Thibault, M Couturier, P Auzepy. Crit Care Med 1990;18:4.

Vitamin E (Vit E) is an important component of the lung's defense against oxidant injury. The aim of this study was to determine (a) if adult respiratory distress syndrome (ARDS) was associated with a decrease in Vit E plasma level linked to an enhancement of plasma lipoperoxidation, and (b) if this Vit E deficiency might be explained by malnutrition and/or a consumption defect. Vit E, lipoperoxides (LP), total lipids, and fatty acid plasma levels were measured in 12 patients with ARDS ($P_{aO_2} \leq 60$ torr with F_{IO_2} 0.6 on mechanical ventilation). At the onset of ARDS (T_0), the decrease in Vit E plasma level was significant ($p < .001$) 7.73 ± 0.54 (n = 12) vs 11.46 ± 0.55 mg/L (n = 7) in the control group (healthy subjects breathing room air). A significant ($p < .05$) increase in LP was simultaneously observed (4.12 ± 0.35 [n = 12] vs 2.94 ± 0.30 nmol/mL [n = 17]) in the control group. At T_0, LP were inversely correlated with Vit E plasma levels ($r = .78$, $p < .01$). Vit E deficiency was associated with low levels of total plasma lipids (3.68 ± 0.25 g/L) and plasma cholesterol (0.97 ± 0.07 g/L). Thus, the Vit E/total lipids ratio (2.18 ± 0.17 mg/g) was always above the accepted normal limit value for this ratio (0.8 mg/g). Significant decreases in essential fatty acid and linoleic acid ($p < .01$) and arachidonic acid ($p < .05$); and a significant ($p < .05$) increase in the oleic/linoleic acid ratio of 1.42 ± 0.16 vs 0.91 ± 0.51 in the control group (n = 18) were simultaneously observed. During the 24 h after ARDS onset (n = 9), a significant decrease in LP was observed; ie, –36% ($p < .01$) 6 h after ARDS onset, to –24% ($p < .05$) at 12 and 24 h, associated with a slight decrease in Vit E plotted against time, T_0, 12, and 24 h after ARDS onset ($Y = -0.03X + 7.34$, $p < .001$) without any significant change in the oleic/linoleic acid ratio. We concluded that (a) ARDS was associated with Vit E deficiency and enhancement of plasma lipoperoxidation; (b) the low basal values of Vit E were linked to the low cholesterol and total lipid plasma levels, probably as a consequence of malnutrition; and (c) during the course of ARDS, a significant Vit E plasma level decrease was observed, either as a consequence of increased utilization or as a consequence of decreased absorption.

Clinical Significance of Airway Responsiveness in Children of Low Birthweight—KN Chan, A Elliman, E Bryan, M Silverman. Pediatr Pulmonol 1989;7:251.

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We report a prospective study of airway responsiveness in a cohort of 121 children of low birthweight (under 2,000 g) at 7 years and a random sample of 100 local schoolchildren of the same age. A positive airway response was defined as a 20% fall in peak expiratory flow rate in response to a cumulative histamine dose of 3 μmol or less. We found a moderate increase in airway responsiveness to inhaled histamine in the cohort (44%) compared with the reference group (22%). There was no significant association between airway responsiveness and any perinatal variables including the level of respiratory support. The findings suggested that neonatal respiratory illness or its treatment did not play a major role in determining the long-term airway responsiveness in these children. Amongst all factors examined, reduced airway function at the age of 7 was most strongly associated with airway responsiveness, independent of perinatal and familial factors. Airway responsiveness was associated with significantly more chest symptoms. We suggest that increased airway responsiveness to inhaled histamine in low birthweight children is a consequence rather than the cause of reduced airway function and argue against the presence of any other form of airway dysfunction as a cause of airway responsiveness.

Pulmonary Abnormalities in Crohn's Disease—JB Neilly, ANH Main, C McSharry, J Murray, RI Russell, F Moran. Respir Med 1989;83:487.

Abnormalities of pulmonary function in Crohn's disease have been described, although the results are conflicting and anecdotal accounts of lung involvement are few. In this study we assessed the prevalence of lung function abnormalities in Crohn's disease, and the relative contributions of age, sex, smoking and past medical history, and Crohn's disease activity to the pulmonary abnormalities found. Twenty-nine patients with Crohn's disease and 29 age-, sex-, and smoking-matched volunteer controls underwent detailed respiratory assessment. Airways obstruction due to chronic bronchitis and asthma was present in 13 patients with Crohn's disease, but was not more prevalent than in the control group. FEV_1 was similar in both Crohn's disease and control subjects (84.2 $\pm$ 21.2% predicted, mean $\pm$ SD; 93.7 $\pm$ 16.3%, respectively: NS). The vital capacity was significantly lower in the Crohn's disease patients than in controls (86.7 $\pm$ 16.6%; 95.9 $\pm$ 12.7%: $p < 0.01$), but this may have been influenced by the higher prevalence of past or intercurrent medical illnesses affecting the chest in Crohn's disease patients. No patient had evidence of fibrosing alveolitis or bronchiectasis. The hemoglobin corrected transfer factor was significantly lower in the Crohn's disease patients than in controls (100.4 $\pm$ 17.4%; 113.2 $\pm$ 25.1: $p < 0.05$) but the diffusing coefficient was not significantly different. There was a significant correlation ($r = 0.44$, $p < 0.05$) between the residual volume and the Crohn's disease activity index but otherwise no close relationship was observed between Crohn's disease activity, extent or duration and the indices of lung function. These findings suggest that the lungs are relatively unaffected by Crohn's disease.

Comparison of Prehospital Conventional and Simultaneous Compression-Ventilation Cardiopulmonary Resuscitation—JP Krischer, EG Fine, ML Weisfeldt, AD Guerci, E Nagel, N Chandra. Crit Care Med 1989; 17:1263.

Nine hundred ninety-four patients were enrolled in a field trial in which ambulance crews were randomly assigned to use simultaneous compression-ventilation (SC-V) CPR or conventional CPR procedures in the prehospital setting. Survival to hospital admission and to discharge was superior in the conventional CPR group vs the experimental group ($p < .01$). In a subset of adult cases whose causes of arrest were nontraumatic, survivor rates still favored the conventional CPR group: 33.5% of 337 vs 22.5% of 365 ($p < .001$). In limited cases where cardiac arrest was due to other heart disease, was vascular in origin or secondary to other natural diseases or from hypertensive cardiovascular disease, or when ECG on arrival was an agonal rhythm, survival was better (but not statistically significantly) in the experimental group. There were no statistically significant differences in the Glasgow coma scores between surviving patients in either group at 24 h post-hospital admission or discharge. It is concluded that survival in the SC-V CPR group was lower, likely reflecting a deleterious effect of the experimental technique of resuscitation. Also noted was that 14%

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of the control patients and 6% of the experimental patients survived with manual CPR alone.

Stability of Patient Preferences Regarding Life-Sustaining Treatment—MA Everhart, RA Pearlman. Chest 1990;97:159.

Physicians often express concern about the reliability of critically ill patients' preferences regarding life-sustaining treatments. We interviewed 30 Veterans Administration intensive care unit patients to determine their preferences for resuscitation, resuscitation requiring mechanical ventilation, artificial hydration and nutrition, and hospitalization for treatment of pneumonia. Patients expressed their preferences considering their current health and then two hypothetical scenarios, stroke and dementia. Follow-up interviews occurred one month later to assess preference stability. We found a diversity of opinions about life-sustaining treatments. Despite significant changes in health status and mood ($p < 0.05$), treatment preferences were stable over time (kappa = .35-.70). Our results suggest that life-sustaining treatment preferences solicited during a serious illness are reliable and may be used in decision making when a patient becomes unable to communicate or is mentally incapacitated.

Heat and Moisture Exchangers and Vaporizing Humidifiers in the Intensive Care Unit—C Martin, G Perrin, M-J Gevaudan, P Saux, F Gouin. Chest 1990;97:144.

A prospective, randomized, controlled study was undertaken to compare the Pall Ultipor breathing circuit filter (PUBCF), a heat-and-moisture exchanger, and heated hot water systems (HHWSs) in ICU patients submitted to controlled mechanical ventilation. Humidification of inspired gas and bacterial contamination of breathing circuits were evaluated. During the study, there were six episodes of tracheostomy tube (TT) occlusion in six patients included in the PUBCF group. No patient out of 42 included in the HHWS group experienced this complication ($p < 0.01$). There were 4% of days with thick and tenacious bronchial secretions in the PUBCF group and no case in the HHWS group ($p < 0.02$). In the PUBCF group, 23% of days with hypothermia were noted as opposed to 12% in the HHWS group ($p < 0.01$). Fewer breathing circuits were found to be contaminated in the PUBCF group (11%) than in the HHWS group (54%, $p < 0.01$). In patients with an organism growing in bronchial specimens, the same organism was found to contaminate the breathing circuit in 10% of cases in the PUBCF group and 77% of cases in the HHWS ($p < 0.01$). We conclude that, in the conditions of this study, the PUBCF did not provide sufficient humidification of inspired gas in ICU patients. Protection against contamination of breathing circuits was effective, but 10% of patients remained at risk for this complication.

Ventilatory Muscle Support in Respiratory Failure with Nasal Positive Pressure Ventilation—Z Carrey, SB Gottfried, RD Levy. Chest 1990;97:150.

Long-term intermittent mechanical ventilation results in improvements in ventilatory performance and clinical status between ventilation sessions in patients with chronic respiratory failure. The application of intermittent positive pressure ventilation through a nasal mask (NPPV) is a simple, noninvasive method for the provision of chronic intermittent ventilatory support. We investigated the effects of NPPV on inspiratory muscle activity in three normal subjects and nine patients with acute or chronic ventilatory failure due to restrictive (four subjects) or obstructive (five subjects) respiratory disorders. NPPV resulted in reductions of phasic diaphragm electromyogram amplitude to 6.7 $\pm$ 0.7% (mean $\pm$ SEM) of values obtained during spontaneous breathing in the normal subjects, 6.4 $\pm$ 3.2% in the restrictive group, and 8.3 $\pm$ 5.1% in the obstructive group. Simultaneous decreases in activity of accessory respiratory muscles were observed. The reductions in inspiratory muscle activity were confirmed by the finding of positive intrathoracic pressure swings on inspiration in all subjects. With NPPV, oxygen saturation and P_{CO_2} remained stable or improved as compared with values obtained during spontaneous breathing. These results indicate that NPPV can noninvasively provide ventilatory support while reducing inspiratory muscle energy expenditure in acute and chronic respiratory failure of diverse etiology. Long-term assisted ventilation with NPPV may be useful in improving ventilatory performance by resting the inspiratory muscles.

Succinylcholine and Atropine for Premedication of the Newborn Infant before Nasotracheal Intubation: A Randomized, Controlled Trial—KJ Barrington, NN Finer, PC Etches. Crit Care Med 1989;17:1293.

Twenty preterm newborn infants were randomized to receive either atropine alone (20 μg/kg) or atropine plus succinylcholine (2 mg/kg) before nasotracheal intubation. Heart rate, BP, transcutaneous PO_2, and intracranial pressure were monitored continuously before, during, and after intubation. No infants developed bradycardia or hypoxia. Intracranial hypertension developed during intubation in the infants receiving atropine alone, but was prevented by premedication with succinylcholine and atropine ($p < .01$). A 41% increase in systemic BP occurred immediately after the administration of succinylcholine ($p < .01$). BP increased during intubation in both

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groups, and the overall peak BP was not significantly different between the groups. Intubation was significantly shorter in the infants receiving succinylcholine. Premedication with succinylcholine and atropine will facilitate intubation of neonates, and ameliorate the adverse physiologic consequences of this procedure.

Analysis of Resistance to Gas Flow in Nine Adult Ventilator Circuits—FH Dennison, AA Taft, SC Mishoe, LL Hooker, SB Eatherly, RW Beckham. Chest 1989;96:1374.

We measured the resistance in nine complete ventilator circuits, partial circuits, and 7, 8, and 9 mm ID endotracheal tubes (ETTs) at flowrates of 20 to 120 L/min. We found a statistically significant ($p < 0.01$) increase in resistive pressure with increases in flow rate, as the diameter of the ETT decreased, and as each component of the ventilator circuit was added to the ETT. There was a curvilinear increase in resistive pressure to increase in flow rate. However, when resistances were computed, the Bennett cascade 'circuit' created higher resistance at 20 L/min than at flowrates up to 120 L/min. The Bennett cascade humidifier added the greatest resistive pressure, 3.5 to 8.5 cm H_2O, the Engstrom Edith, 0.5 to 6.5 cm H_2O, and the Conchapak added the least, 0.0 to 2.5 cm H_2O at flowrates of 20 to 120 L/min. After all the components of the ventilator circuit were attached to the ETTs, there was approximately a 97 to 450 percent increase in resistive pressure compared to the resistive pressure created by the ETTs alone.

Continuous In-line Nebulizers Complicate Pressure Support Ventilation—CD Beaty, RH Ritz, MS Benson. Chest 1989;96:1360.

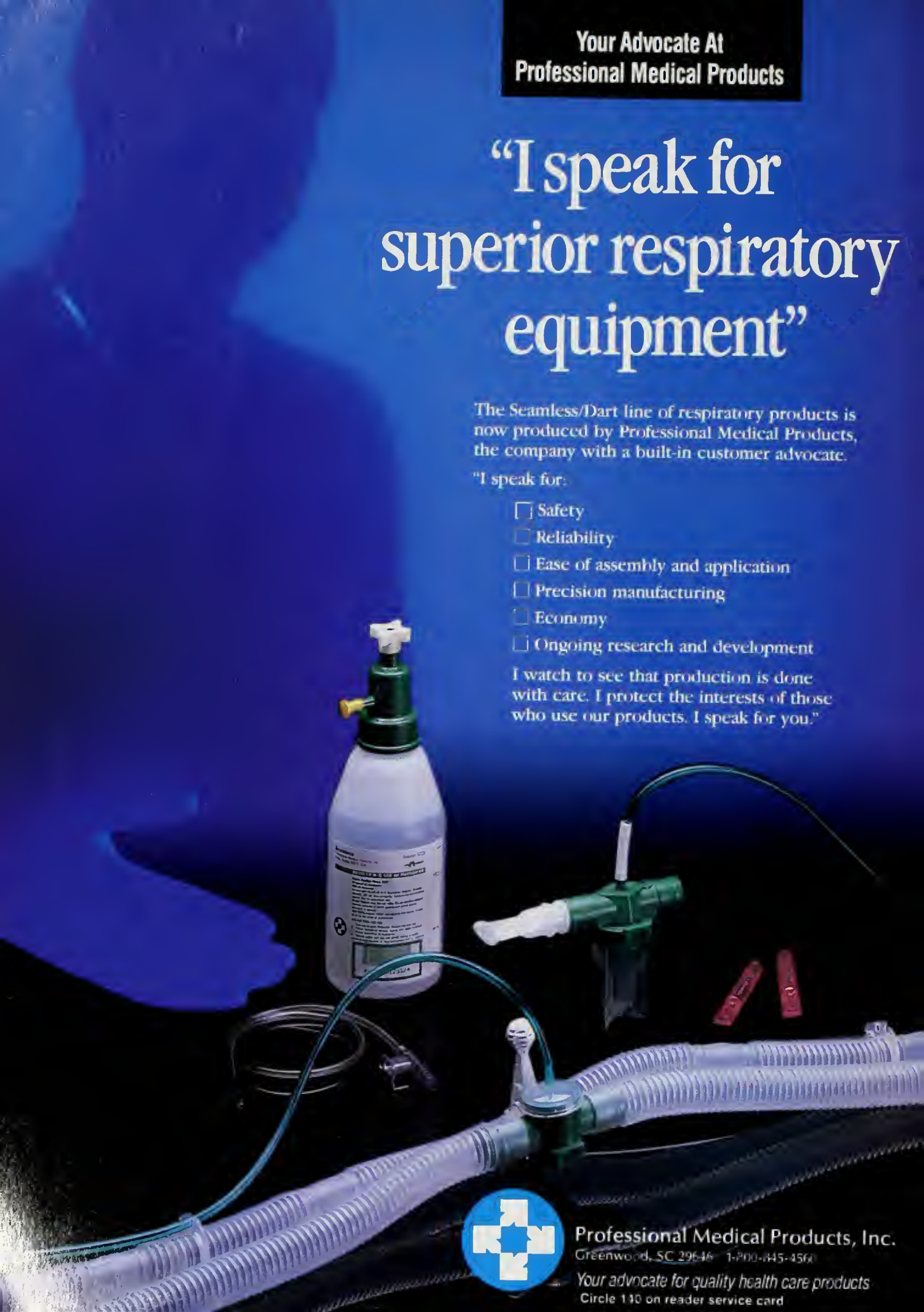
Patients ventilated in the pressure support mode must generate a negative airway pressure before the ventilator will deliver a breath. Inserting a continuous-flow nebulizer between the patient and the sensor in the ventilator makes it more difficult for the patient to generate this negative pressure. We observed two mechanically ventilated patients who were unable to initiate ventilator breaths in the pressure support mode while bronchodilators were being administered through a continuous-flow nebulizer. In neither case did ventilator alarms sound. Using a lung model, we found that when the nebulizer flow rate exceeded the mean inspiratory flow rate of the test lung, the negative pressure necessary to trigger the pressure support ventilator could not be generated. Critical care providers need to be aware of this potential complication, since it may lead to serious underventilation of their patients.

Decline in the Risk of Myocardial Infarction among Women Who Stop Smoking—L Rosenberg, JR Palmer, S Shapiro. N Engl J Med 1990;322: 213.

To assess the relation of smoking cessation to the risk of a first myocardial infarction in women, we compared the smoking habits of 910 patients who had had their first myocardial infarction with those of 2375 controls in a hospital-based case-control study of women from 25 to 64 years of age. The estimate of relative risk among current smokers as compared with women who had never smoked was 3.6 (95% confidence interval, 3.0 to 4.4). Among exsmokers overall, the corresponding estimate of relative risk was 1.2 (95% confidence interval, 1.0 to 1.7). Among exsmokers, the estimate of relative risk was significantly elevated among women who had stopped smoking less than two years previously (relative risk 2.6; 95% confidence interval, 1.8 to 3.8). Most of the increase in the risk had dissipated among the women who had stopped smoking two to three years previously, and the estimate of relative risk among the women who had not smoked for three or more years was virtually indistinguishable from that among the women who had never smoked. The same pattern of decline was apparent regardless of the amount smoked, the duration of smoking, the age of the women, or the presence of other predisposing factors. These data suggest that in women, as in men, the increase in the risk of a first myocardial infarction among cigarette smokers declines soon after the cessation of smoking and is largely dissipated after two or three years.

Capillary Blood Gases in the Neonate: A Reassessment and Review of the Literature—SE Courtney, KR Weber, LA Breakie, et al. AJDC 1990;144:168.

Heel puncture capillary blood gas (CBG) measurements continue to be used in neonates for estimating arterial blood gas values. Review of the literature reveals general agreement that CBG P_{O_2} values are of little use in predicting arterial P_{O_2} and that CBG pH values are reliable predictors of arterial pH; opinion varies regarding CBG P_{CO_2}. We conducted a two-part study comparing postductal-arterial and CBG values. First, 50 infants were studied, each only once. All infants had umbilical arterial catheters in place. Blood was obtained simultaneously from the umbilical artery catheter and the warmed heels. Results demonstrated poor predictability of arterial values from CBG pH and P_{CO_2} as well as for P_{O_2}. Second, to determine if variation both within and among individuals was similar, repeated measurement were made in 27 additional infants comparable to the first group. We obtained 3 to 28 simultaneous postductal-arterial and CBG samples from each infant. A random-effects nested analysis of variance indicated that for pH, variation was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largely the result of between-subject or within-subject replicates effects, while for P_{O_2} and P_{CO_2}, most variation was explained by differences between the two techniques (umbilical artery catheter vs CBG). The results indicate that CBG measurements do not accurately predict arterial values in neonates. Extreme caution should be used when management decisions are based on CBG values.

When Is a Test Result Abnormal? Defining Limits and Risks—J Charrow, LV Hedges. AJDC 1990; 144:245.

Test results from 'normal' and 'nonnormal' individuals frequently overlap. Individuals with test results near the region of overlap have a high risk of being misdiagnosed. We present a statistical method for quantifying the certainty of diagnoses and defining a normal range, and illustrate its application with a specific example from a Tay-Sachs disease carrier screening program. This method can be applied to any test result based on a continuous variable and is particularly well suited to screening programs where the risk of incidence of a disease is known. We use an inconclusive range to reduce the likelihood of incorrect diagnoses resulting from measurement error and borderline results. The limits of the normal, inconclusive, and nonnormal ranges are based on three considerations: (1) the probability of misdiagnoses, (2) the expected frequency of inconclusive diagnoses, and (3) the reproducibility of the test results.

Increased Airway Leukotriene Levels in Infants with Severe Bronchopulmonary Dysplasia—R Mirro, W Armstead, C Leffler. AJDC 1990; 144:160.

The sulphidopeptide leukotrienes (C_4, D_4, and E_4) are potent airway constrictors that have been detected in the airways of infants with pulmonary hypertension and viral infections. The present study was undertaken to test the hypothesis that leukotrienes in tracheal lavage fluid are elevated in bronchopulmonary dysplasia. Twenty-six intubated infants (10 with bronchopulmonary dysplasia, 9 with hyaline membrane disease, and 7 normal controls) had tracheal lavage leukotriene levels determined by radioimmunoassay. Lavage fluid cell counts (alveolar macrophages) and leukotriene levels were significantly increased in infants with severe bronchopulmonary dysplasia. The increased concentration of leukotrienes seen in the infants with bronchopulmonary dysplasia would suggest a possible role for these compounds in the pathophysiology of this disease.

Comparison of Outpatient Nebulized vs Metered Dose Inhaler Terbutaline in Chronic Airflow Obstruction—H Mestitz, JM Copland, CF McDonald. Chest 1989;96:1237.

Eighteen patients (nine asthmatic patients and nine with poorly reversible airflow obstruction) with stable, severe chronic airflow obstruction, completed a four-week randomized, double-blind, placebo-control, crossover trial comparing the acute and chronic effects of terbutaline administered by metered-dose inhaler (MDI) and nebulizer (NEB). Equipotent doses of terbutaline were selected from the comparison of separate cumulative dose-response curves for MDI and NEB. The MDI and NEB given acutely produced similar bronchodilatation and improvement in exercise performance. Spirometric indices, 6 min walking distance, symptom scores, and extra beta-agonist use were no different between MDI and NEB treatment fortnights in the outpatient study. We conclude that the degree of bronchodilatation achieved in these patients is a reflection of the dose of bronchodilator administered and not the mode of administration. There is no justification for the preferred outpatient use of nebulized bronchodilators in patients with stable chronic airflow obstruction who can use adequate doses of bronchodilators via a metered-dose inhaler.

Nebulizer vs Spacer for Bronchodilator Delivery in Patients Hospitalized for Acute Exacerbations of COPD—RB Berry, RA Shinto, FH Wong, JA Despars, RW Light. Chest 1989;96:1241.

This double-blind crossover study compared the efficacy of two methods of delivery (MDI-spacer and nebulizer) of inhaled albuterol to patients hospitalized for an acute exacerbation of COPD. Within 24 h of admission, 20 subjects (mean age, 69 years) with severe airflow obstruction (mean FEV_1, 0.69 L) were subjected to a treatment with an MDI-spacer (0.36 mg of albuterol or placebo) followed by treatment with a nebulizer (2.5 mg of albuterol or placebo). Active drug was given by only one device (randomly assigned in a double-blind manner), and the entire sequence was repeated in 4 h, with active drug given in the alternate device. Spirometric data and the Borg dyspnea score were obtained before and 1 h after each sequence of treatments. Treatment resulted in significant improvements in the FEV_1, FVC, and Borg score. The percent improvement in the FEV_1 was slightly larger after treatment with the nebulizer (16.7 percent vs 13.4 percent). Improvements in the Borg score were slightly larger after treatment with the MDI-spacer (−1.08 vs −0.73). However, these differences were not statistically significant. This study suggests that the MDI-spacer system is an effective method of sympathomimetic delivery in this setting, provided patients are able to master the technique.

The Relationship between Pulmonary Function and Dyspnea in Obstructive Lung Disease—N Wolkove, E Dajczman, A Colacone, H Kreisman. Chest 1989;96:1247.

Increased importance is now being placed on evaluating dyspnea in patients with obstructive lung disease (OLD). We measured breathlessness at rest, using a Borg scale dyspnea index (BSDI) before and after bronchodilator (albuterol [salbutamol] 200μ) in 93 patients with OLD drawn from a larger population undergoing routine spirometry. The median BSDI declined from 3 to 1 before and after bronchodilator, suggesting improvement in dyspnea. However, there was no correlation between initial or post-bronchodilator spirometry and BSDI. The change in FEV_1 similarly did not correlate with the change in BSDI ($r = 0.05$). A large bronchodilator response was usually associated with improvement in dyspnea, but the converse was not observed. Thus, of ten patients with an improvement in BSDI of more than two categories, six had a change in FEV_1 of 0.1 L or less after bronchodilator. Analyzing a subgroup of 65 dyspneic patients with an initial BSDI of 2 or more revealed the following response groups: those with either a bronchodilator or dyspnea response alone, both together, or neither. Twenty-eight patients (43%) responded both subjectively and objectively. Eleven (17%) had a bronchodilator response only, seventeen (26%) had a dyspnea response only, while nine (14%) had neither measurable response. We conclude that dyspnea is poorly correlated with results of routine spirometry in patients with OLD. The use of dyspnea ratings may yield information about bronchodilator responsiveness not appreciated by spirometry alone.

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Can Maximal Cardiopulmonary Capacity be Recognized by a Plateau in Oxygen Uptake?—J Myers, D Walsh, N Buchanan, VF Froelicher. Chest 1989;96:1312.

The failure of oxygen uptake to increase with increasing work has been considered a marker of the limits of the cardiopulmonary system for many years. However, the concept has suffered from inconsistencies in definition, criteria, and data sampling, all of which affect the interpretation of the relation between changes in work and oxygen uptake. To evaluate the response and reproducibility of the slope in oxygen uptake at peak exercise, six subjects (mean age, 33 $\pm$ 6 years) performed two individualized ramp treadmill tests on separate days. During exercise, oxygen uptake (for a given sample of 30 eight-breath running averages) was regressed with time and the slope was calculated. Maximal oxygen uptake, maximal heart rate and maximal perceived exertion were reproducible from day 1 to day 2 (mean difference, 0.4 ml/kg/min, 1.0 beats per minute, and 0.2 for maximal oxygen uptake, heart rate, and maximal perceived exertion, respectively [not significant]). Considerable variability in the slopes was observed during each test and from day to day. This occurred despite the use of large gas exchange samples, averaging techniques, and constant, consistent changes in external work. A plateau, defined as the slope of an oxygen uptake sample at peak exercise that did not differ significantly from a slope of zero, was not a consistent finding within subjects between days. We conclude that marked variability in the slope of the change in oxygen uptake occurs throughout progressive exercise, despite the use of large samples and a linear change in external work. These findings appear to preclude the determination of a plateau by common definitions.

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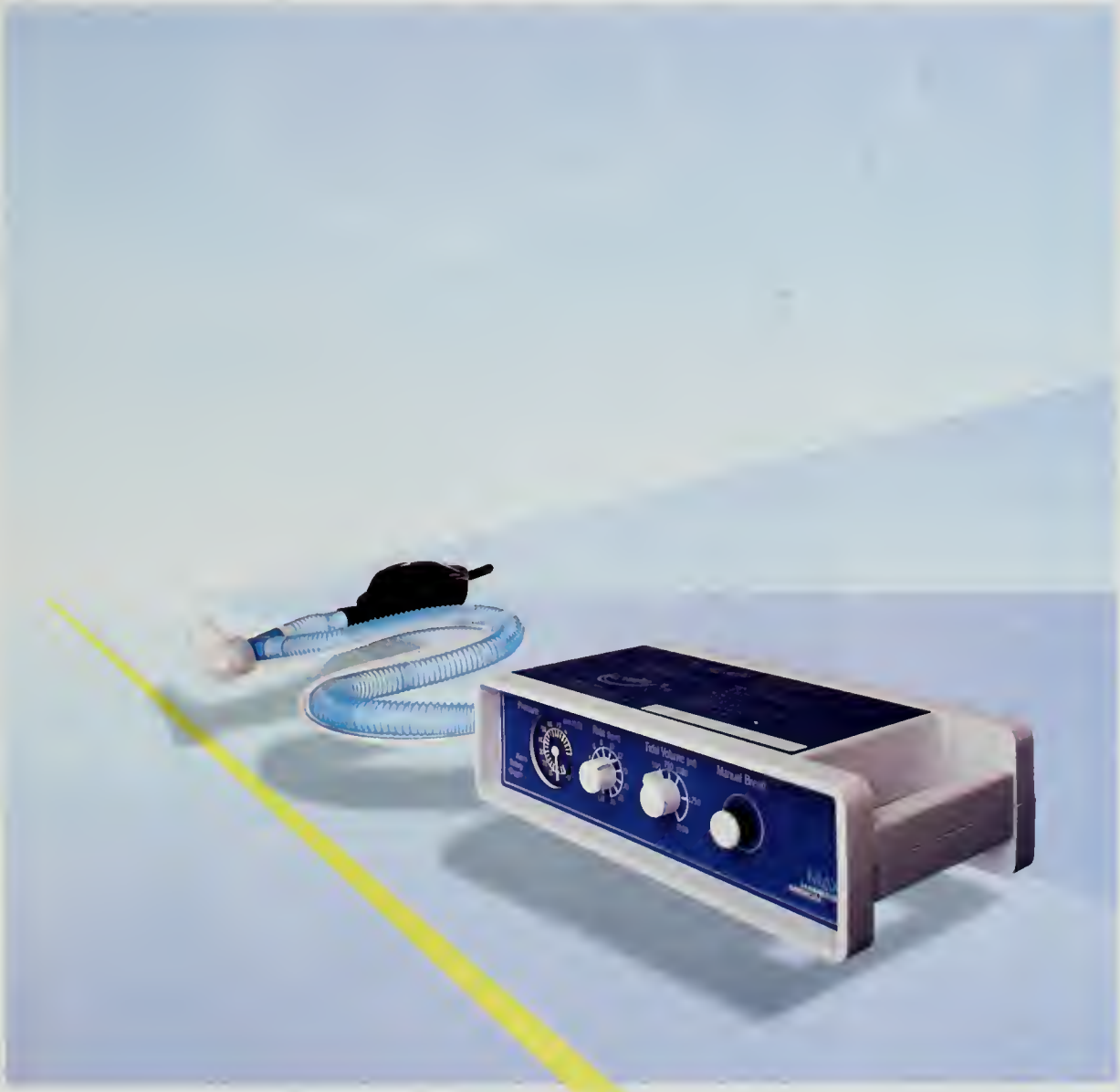

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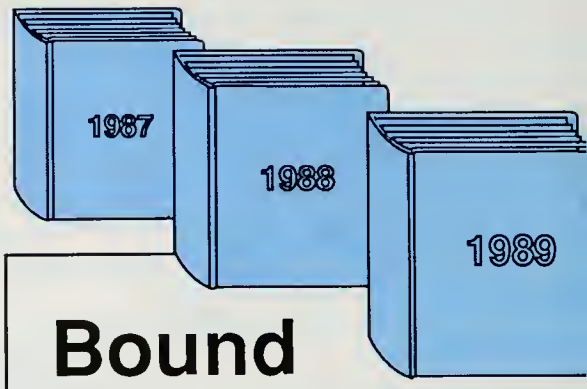

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Pulmonary Rehabilitation—What Are the Outcomes?

The last three decades have seen great strides in defining the role of pulmonary rehabilitation in the management of patients with chronic obstructive pulmonary diseases (COPD). Studies in the 1960s laid the basis for defining the components of a comprehensive pulmonary rehabilitation program. The efficacy of chronic oxygen therapy was documented in the 1970s. In the 1980s, the shifting focus of medical care—from the hospital to the home—led to a resurgence of interest in pulmonary rehabilitation. The agenda for the health care system in the 1990s will be to determine the outcomes of medical care.[1,2] This new agenda comes at an opportune time in the development of pulmonary rehabilitation, which has become more scientifically based. Over the next decade, the precise role of pulmonary rehabilitation in the management of COPD will be more clearly delineated by assessing the outcomes of its individual components.[3,4] But, before answers can be provided, a basic question must be posed: What potential outcomes (mortality, morbidity, performance of activities of daily living, or respiratory symptoms) of pulmonary rehabilitation are most important?

Survival might be considered an important outcome for any patient. Although the use of oxygen for treatment of chronic hypoxia clearly increases survival in COPD,[5] pulmonary rehabilitation has not been conclusively demonstrated to affect mortality. Although Sahn and Petty[6] and Hodgkin and coworkers[4] have reported improved survival in patients undergoing pulmonary rehabilitation, neither study employed a control group. However, it is conceivable that the psychosocial and educational components of pulmonary rehabilitation may improve compliance with oxygen and medical therapy and thereby reduce mortality. The effects of pulmonary rehabilitation on mortality will probably never be decided conclusively because the answer would require study of a large number of patients followed over a period of years, with use of a concurrent control population not enrolled in a pulmonary rehabilitation program. However, emphasis on mortality as the only outcome signifies an oversimplification of the problems faced by patients with COPD.

As early as 1969, Cherniack and colleagues[7] demonstrated that "pulmonary rehabilitation," ie, a home-based program of IPPB and chest physiotherapy for recurrently hospitalized patients with COPD, reduced the need for hospitalization. Hudson et al[8] and Dunham et al[9] have demonstrated similar results. Bria et al[10] have recently shown that the reduction in hospital days is accompanied by an increase in the number of phone calls to physicians following rehabilitation—suggesting a shift of costs from more expensive hospital-based care to less expensive outpatient alternatives. Thus far it is unclear whether education with emphasis on self-management, better medical care, closer follow-up, or improved physical conditioning is the reason for the reduction in hospitalizations.

To the healthy observer, decreased mortality and morbidity may seem to be the most important outcome of a rehabilitation program, but people with

chronic illness may become depressed because of the limitations imposed upon them by their disease. Thus, to many patients, increased longevity may appear only to prolong suffering. From the perspective of the person who must live with the effects and limitations imposed by his COPD, the most important issues are how he feels today and what he can do in his daily life. Such "quality of life" issues include several dimensions of health: (1) physical health, (2) mental health, (3) social functioning, (4) role functioning, and (5) perception of well-being.[11] Within this framework, the article by Holden et al in this issue of RESPIRATORY CARE assesses the "functional status" of patients following a "rehabilitation program."[12] Their program consisted of several different therapeutic modalities employed in 12 sessions over 6 weeks. The therapy included walking, stretching, and light weight training supervised by physical therapists; energy conservation and work simplification instructions provided by occupational therapists; and instruction on nutrition and medications. Three different measurement tools were used to assess patients' *perceptions*. Two of the instruments (Medical Research Council Index and Modified Pneumoconiosis Research Unit Score) recorded the subject's perception of his walking ability. A third instrument, the Modified Dyspnea Index, assessed the patient's perception of his ability to perform a wider range of daily activities and also included indices to quantitate the pace at which tasks could be performed and the difficulty of the tasks. The Modified Dyspnea Index scores suggested a greater degree of improvement than did the scores determined by the other two measurement instruments.

Most importantly, the results of Holden et al indicate that the pulmonary rehabilitation modalities employed improved not only the patient's perception of abilities, but also the actual ability to walk (as demonstrated by a 27% increase in 6-minute walk distance). As in other studies, there was no change in spirometric values and oxygen saturation. Although these results strongly suggest that patients undergoing pulmonary rehabilitation have improved general health, future studies will need to more comprehensively address other aspects of physical health, social functioning, role functioning, and mental health. Therapeutic modalities will have to be employed singly, and not in combination, in order to assess their relative benefits. With such information we can then apply pulmonary rehabilitation in an individualized manner, prescribe the most appropriate components based upon the needs and goals of individuals with COPD, and employ the techniques of pulmonary rehabilitation more widely to benefit greater numbers of patients.

The mechanism for the improvements noted by Holden et al[12] are not addressed by the authors. Because the supervised exercise regimen was applied only twice a week (although participants were encouraged to exercise at home), psychological benefits from the rehabilitation program may have led to improved walking ability and perception of abilities. It has been suggested that exercise training may "desensitize" patients to dyspnea.[13] In the pulmonary rehabilitation program at the National Jewish Center for Immunology and Respiratory Medicine in Denver, we have observed that exercise supervised by health professionals improves the patient's confidence in his abilities and decreases shortness of breath and may, thus, improve both the patient's actual and perceived capacity for activity. In addition, many of our deconditioned patients appear to achieve cardiovascular benefits with exercise, despite conventional wisdom that patients with pulmonary disease cannot achieve a conditioning level of exercise. Lastly, our results suggest that respiratory muscle function may be improved following exercise training.[14]

Based upon the available studies to date, we can expect that pulmonary rehabilitation will improve some indices of overall health, thereby allowing our patients to lead full and more satisfying lives.

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REFERENCES

1. Ellwood PM. Outcomes management: A technology of patient experience. N Engl J Med 1988;318:1549-1556.
2. Riesenberg D, Glass RM. The medical outcome study. JAMA 1989;262:943.
3. Make BJ. Pulmonary rehabilitation: Myth or reality? Clin Chest Med 1986;7:519-540.
4. Hodgkin JE, Branscomb BV, Anholm JD, et al. Benefits, limitations, and the future of pulmonary rehabilitation. In: Hodgkin JE, Zorn EG, Connors GL, eds. Pulmonary rehabilitation: Guidelines to success. Boston: Butterworths, 1984.
5. Nocturnal Oxygen Therapy Trial Group. Continuous or nocturnal oxygen therapy in hypoxemic chronic obstructive lung disease. Ann Intern Med 1980;93:391-395.
6. Sahn SA, Petty TL. Results of a comprehensive rehabilitation program for severe COPD. In: Petty TL, ed. Chronic obstructive pulmonary disease. New York: Marcel Dekker, 1978.
7. Cherniack RM, Handford RG, Svanhill E. Home care of chronic respiratory disease. JAMA 1969;208:821-824.
8. Hudson LD, Tyler ML, Petty TL. Hospitalization needs during an outpatient pulmonary rehabilitation program. Chest 1976;10:607-610.
9. Dunham JL, Hodgkin JE, Nicol J, Burton GG. Cost effectiveness of pulmonary rehabilitation programs. In: Hodgkin JE, Zorn EG, Connors GL, eds. Pulmonary rehabilitation: Guidelines to success. Boston: Butterworths, 1984.
10. Bria W, Stillerman R, Lemoine M, Niles D, Saldega A. Effect of pulmonary rehabilitation on health care utilization (abstract). Chest 1987;92(Suppl):153S.
11. Ware JE. Standards for validating health measures: Definition and content. J Chron Dis 1987;6:473-480.
12. Holden DA, Stelmach KD, Curtis PS, Beck GJ, Stoller JK. The impact of a rehabilitation program on functional status of patients with chronic lung disease. Respir Care 1990;35:332-341.
13. Agle DP, Baum GL, Chester EH, Wendt M. Multidiscipline treatment of chronic pulmonary insufficiency: 1. Psychologic aspect of rehabilitation. Psychosom Med 1973;35:41-49.
14. Celli B, Lee H, Criner G, et al. Controlled trial of external negative pressure ventilation in patients with severe chronic airflow obstruction. Am Rev Respir Dis 1989;140:1251-1256.

Original Contributions

The Impact of a Rehabilitation Program on Functional Status of Patients with Chronic Lung Disease

David A Holden MD, Kay D Stelmach RN RRT, Patricia S Curtis PA-C RN
Gerald J Beck PhD, James K Stoller MD

Although one purpose of pulmonary rehabilitation is to enhance patients' performance, perceived difficulty in assessing functional status has discouraged its measurement as an outcome event in efficacy studies of pulmonary rehabilitation. METHODS: We sought to address this shortcoming by evaluating the efficacy of a 12-session, 6-week, comprehensive rehabilitation program in 16 patients with severe lung disease (FEV_1 = 0.94 ± 0.42 L [mean ± standard deviation]), assessing changes in spirometry, oxygen saturation, 6-minute walk distance, and functional performance as measured by three scales (Medical Research Council Index, Modified Pneumoconiosis Research Unit Score, and the Modified Dyspnea Index). RESULTS: Although no improvement in airflow or oxygen saturation occurred, mean 6-minute walk distance increased by 27%, and the rehabilitation program did confer functional benefits, as reflected by significant improvement in all three functional status scores. CONCLUSION: Pulmonary rehabilitation of patients with chronic lung disease can enhance their walking capacity and functional status as measured by the three scales. Our comparison of the scores on the three functional scales suggests that the Modified Dyspnea Index may be the most sensitive measure of changes in patients' functional status. (Respir Care 1990;35:332-341.)

Introduction

Pulmonary rehabilitation programs are widespread and may include several components, such as physical therapy, occupational therapy, emotional support, and breathing technique instruction. Many studies suggest that pulmonary rehabilitation programs are effective,[1-14] despite the general consensus that airflow and gas exchange are not enhanced by pulmonary rehabilitation. Because the primary goal of pulmonary rehabilitation is to enhance the patient's ability to function in daily life, more persuasive outcome events include measures of exercise capacity such as walking distance and oxygen consumption at submaximal and maximal exercise.[13] Even more relevant as an outcome measure, though less commonly studied, is the patient's functional status during daily activities as measured by several available functional status scales, including the Medical Research Council Dyspnea Index (MRCI),[15] the Modified Pneumoconiosis Research Unit Score (MPRUS),[16] the Baseline and Transition Dyspnea Index,[17] and the Modified Dyspnea Index (MDI).[16] Few studies have examined the impact of pulmonary rehabilitation on patient performance assessed by these scales, although available results suggest that pulmonary rehabilitation does confer functional benefit.[11,12]

To further analyze the efficacy of pulmonary rehabilitation, we undertook the present study with three goals in mind: (1) to assess the benefits of a pulmonary rehabilitation program on the functional

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status of patients with chronic lung diseases; (2) to compare any functional benefits of pulmonary rehabilitation with physiologic benefits, eg, airflow, oxygenation, or walking distance; and (3) to compare the performance of the indexes of functional status: the MDI, the MRCI, and the MPRUS.

Methods

Sixteen patients with lung disease and dyspnea on exertion were recruited for pulmonary rehabilitation from the Outpatient Department of The Cleveland Clinic Foundation (mean age 67, 8 women and 8 men). Entry criteria included: (1) chronic lung disease with exertional dyspnea, (2) clinical stability at study onset, and (3) willingness to participate. Patients were referred to the study between March 1988 and June 1988 by the physicians of the Department of Pulmonary Disease to whom the entry criteria were announced. Because recruitment was at the volition of the physicians on the pulmonary staff, enrollment was not consecutive. Approximately 120 patients meeting Criteria 1 and 2 were seen in the department over the period of study enrollment.

All 16 patients recruited to the study completed the rehabilitation program. Baseline characteristics are listed in Table 1. Fourteen patients had chronic obstructive airway disease. Of those 14, 7 had reversible airway obstruction defined as an increase $\geqslant 15\%$ in FEV_1 in response to an inhaled bronchodilator. One patient had both restrictive and obstructive lung disease, and one patient's disease was restrictive. Only 2 of the 16 patients experienced a change in their medical regimen during the 6-week pulmonary rehabilitation program; one patient was placed on prednisone and the other was taken off theophylline.

The program, which consisted of 12 sessions conducted over 6 weeks, included several components. Patients were seen by therapists in the Department of Physical Therapy for 1 hour twice a week for supervised walking (30 min), stretching (15 min), and light weight-training exercises (15 min).

Table 1. Diagnoses of the 16 Study Patients, with Spirometry Values, Oxygen Saturations, and 6-Minute Distances at Entry

Patient	Diagnosis	FEV_1 (L)	FEV_1 % Predicted	FEV_1/FVC	O_2 Saturation (room air)	6-Minute Walk Distance (ft)
1	Emphysema	0.95	29	0.44	91%	1,028
2	Emphysema	0.75	23	0.27	95%	1,170
3	Emphysema	0.50	21	0.25	*	514
4	Emphysema	1.48	61	0.46	95%	918
5	Emphysema	1.72	62	0.65	93%	852
6	Chronic bronchitis	1.75	47	0.46	93%	1,204
7	Emphysema	0.56	21	0.33	93%	652
8	Emphysema	0.77	23	0.39	92%	257
9	Emphysema	0.59	26	0.34	95%	514
10	Emphysema	0.82	24	0.27	95%	911
11	Emphysema	0.55	25	0.41	93%	693
12	Kyphoscoliosis†	1.25	72	0.79	97%	308
13	Emphysema	0.86	25	0.27	*	231
14	Lymphangiomyomatosis†	0.54	18	0.20	*	231
15	Emphysema	1.18	55	0.46	*	924
16	Emphysema	0.71	23	0.27	95%	385
Mean (± SD)		0.94 (± 0.42)	34.6 (± 18.1)	0.40 (± 0.16)	93.6% (± 1.8)	675 (± 337)
Range		0.50-1.75	18-72	0.20-0.79	91-97	231-1,204

*Patient was maintained on supplemental oxygen.
†Patients 12 and 14 had restrictive disease. Patient 14 also had obstructive disease as can be seen by FEV_1/FVC.

They were encouraged to repeat this at home at least once a week. Although diaries were not kept by the patients, phone interviews were conducted, and most patients reported performing at least one session at home each week. The patients were also seen by therapists in the Department of Occupational Therapy who instructed them in energy-conservation and work-simplification techniques. In the Department of Pulmonary Medicine, the patients were given instruction on medication principles and use, nutrition, and general aspects of chronic lung disease. Throughout the rehabilitation program, interaction among group members and between patients and their families was encouraged through support-group sessions.

We measured airflow variables (FEV_1, FVC, FEV_1/FVC), oxygen saturation at rest, 6-minute walk distance, and functional performance, on study entry and immediately after completion of the program. Spirometry was performed using a Cybermedic Spinnaker spirometer (Cybermedic Inc, Louisville CO), and oxygen saturation was measured with a Nellcor pulse oximeter model N-100 (Nellcor, Hayward CA). All 6-minute walks were conducted on a carpeted hospital corridor, and patients were accompanied during both tests (before and after the rehabilitation program) by the same therapist (KS), who encouraged maximum performance during the walk.

Functional status was determined by scores on the MDI, MRCI, and MPRUS (Appendixes 1-3). These scores were determined during a brief interview on entry and after rehabilitation by the same nurse clinician (PC), who was trained to administer the functional scales and who was unaware of the patient's prior test results.

The MDI[16] is an ordinal scale with possible scores of 0 to 12, composed of three component axes, each with a 0- to 4-point grade (Appendix 1). The first component is the functional impairment grade, which measures limitation of activities from dyspnea and is a composite of grades for functional impairment at home and during work-related activities. The second axis is the magnitude-of-task grade, which assesses the least strenuous task the patient can perform that elicits dyspnea. The remaining axis—the magnitude-of-effort grade—assesses the pace with which the patient can perform his most strenuous task. On each of the component scales and on the total MDI, better functional status is assigned the higher score, unlike both the MRCI and the MPRUS scores in which higher grades denote poorer functional status.

The MRCI is a widely used epidemiologic instrument[15] that closely resembles The American Thoracic Society questionnaire instrument[18] and grades patients on a scale of 1 to 4 (Appendix 2): Grade 1 is assigned to patients who experience dyspnea on vigorous effort only. Grade 2 is assigned to those who experience dyspnea when walking up inclines or when hurrying on level ground. Grade 3 is assigned to patients who are short of breath while walking with others of similar age and physique on level ground, but who could walk a mile slowly or do their own shopping. Patients are assigned to Grade 4 when short of breath on minimal exertion, and when they cannot walk one block or climb one flight of stairs without stopping for breath.

The MPRUS is a 1-to-5 ordinal scale (Appendix 3).[16] Grade-1 patients can climb stairs or hills and walk as fast as other people of similar age and build. Grade 2 is assigned to patients who can keep up on the level but not on climbing hills or stairs. Grade 3 is assigned to patients who cannot keep up on the level but are able to walk a mile at their own pace. Grade 4 is assigned to patients who are unable to walk more than 100 yards on level ground without a rest, and Grade 5 is assigned if the patient is unable to undress, talk, or leave home because of breathlessness.

Pre-rehabilitation and post-rehabilitation results for each measure were compared using a paired t test. Agreement between the change in measures was assessed using the kappa (κ) statistic, an index of agreement between two observers grading dichotomous outcome variables. Values of $\kappa < 0$ indicate poor agreement, values 0.21-0.40 denote fair agreement, 0.41-0.60 denote moderate agreement, and values > 0.60 denote substantial agreement.[19]

Results

Table 2 presents the entry-to-completion changes in all measures for the 16 patients. Post-rehabilitation values did not differ from pre-rehabilitation values in any measure of airflow or oxygenation. A

Table 2. Changes in FEV_1, Oxygen Saturation, Walk Distance, and Functional Status Scores with Rehabilitation

Patient	Change in FEV_1	Change in O_2 Saturation (room air)	Change in 6-Minute Walk Distance (ft)	Change in Functional Status Scores*		
				Total MDI	MRCI	MPRUS
1	0.00	1%	357	1	-1	-1
2	-0.23	0%	355	0	0	0
3	0.06	NA†	654	0	0	0
4	-0.14	-3%	110	2	0	0
5	-0.04	2%	105	2	0	0
6	-0.31	-1%	-36	3	-1	0
7	0.09	-3%	-138	3	-1	0
8	-0.03	0%	140	0	0	0
9	0.09	-1%	871	2	-2	-2
10	-0.12	-1%	-397	1	0	0
11	0.22	-2%	105	0	0	0
12	0.06	-2%	346	3	0	-1
13	-0.09	NA	-91	1	0	0
14	0.01	NA	413	2	-1	-1
15	-0.08	NA	58	1	0	-1
16	-0.11	-2%	12	1	0	0
Mean (± SD)	-0.03 (± 0.13)	-1.0% (± 0.04)	185 (± 313)	1.4 (± 1.1)	-0.4 (± 0.6)	-0.4 (± 0.6)
P Value‡	NS§	NS	$p < 0.03$	$p < 0.001$	$p = 0.03$	$p = 0.03$

*MDI = Modified Dyspnea Index, MRCI = Medical Research Council Index, MPRUS = Modified Pneumoconiosis Research Unit Score; negative value for MRCI and MPRUS value indicates improvement.
†NA = not available (patient on supplemental oxygen).
‡Two-sided paired *t* test, $p < 0.05$ is significant.
§NS = not significant, $p \geq 0.05$.

statistically significant improvement in the 6-minute walk distance was measured with a mean difference of 185 feet, or a 27% increase above the baseline value. The total MDI scores increased from a baseline of 5.2 ± 1.8 (mean ± SD) to a post-rehabilitation value of 6.6 ± 2.0 (mean difference of 1.4 ± 1.1, $p < 0.001$). Each component score of the MDI showed a statistically significant increase after rehabilitation. Both the MRCI and MPRU scores decreased significantly from 3.3 ± 0.7 to 2.9 ± 0.8 (mean difference of -0.4 ± 0.6, $p = 0.03$) and from 3.6 ± 1.0 to 3.2 ± 0.9 (mean difference of -0.4 ± 0.6, $p = 0.03$), suggesting functional improvement after rehabilitation.

Direct comparison of the diagnostic performance of the three functional scales (Figs. 1 and 2) shows that in the 16 patients, the MDI score improved in 12 and remained unchanged in 4, while both the MRCI and the MPRUS improved in 5 and remained unchanged in 11. In no patient did the MRCI or MPRU scores change while the MDI score remained unchanged. The changes in the MDI score were evenly distributed among the three components with composite functional impairment improving in 6 patients, magnitude-of-task improving in 8, and magnitude-of-effort improving in 6. These changes in scores are depicted in Figures 1 and 2. As would be expected from the similarity of MRCI and MPRUS to the magnitude-of-task axis of the MDI, the improvement of the magnitude-of-task score did correlate significantly with improvement in the MRCI or MPRUS ($\kappa = 0.50$, $p < 0.016$) while the other two components of the MDI, composite functional impairment and magnitude of effort, did not (κ = 0.31 and -0.07, respectively). Change in the 6-minute walk distance did not correlate with improvements in the MRCI, MPRU, or MDI scores, nor was there any correlation between the change in the 6-minute walk distance and changes in any component of the MDI.

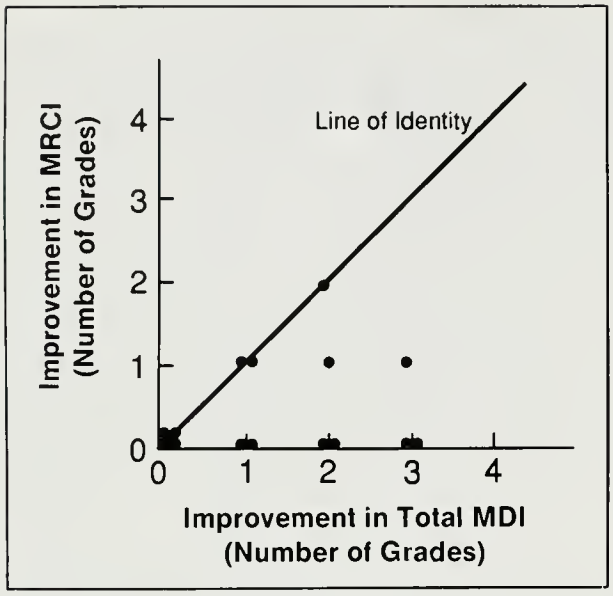

Fig. 1. Improvement in Modified Dyspnea Index (MDI) ratings vs Medical Research Council Index (MRCI) ratings in 16 patients after 12 weeks of pulmonary rehabilitation.

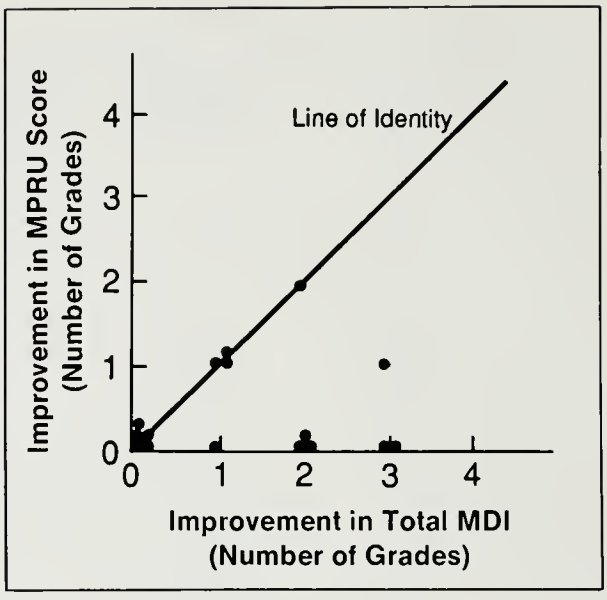

Fig. 2. Improvement in Modified Dyspnea Index (MDI) ratings vs Modified Pneumoconiosis Research Unit Score (MPRUS) ratings in 16 patients after 12 weeks of pulmonary rehabilitation.

Discussion

The major findings of the study are: (1) pulmonary rehabilitation can enhance patients' walking capacity and functional status, as assessed by all the functional scales applied; (2) these improvements are unassociated with changes in airflow or oxygen saturation; and (3) among the functional status scales compared—the Modified Dyspnea Index, the Medical Research Council Index, and the Modified Pneumoconiosis Research Unit Score—the MDI exhibits the greatest sensitivity in detecting improvements in functional status.

The changes seen in Figures 1 and 2 suggest that the MDI detects improvements in functional status that go unappreciated when the other two functional scales in this study are used alone. Such an increased sensitivity would be expected if the MDI, given its greater range of values, were only an expanded scale that measures the same parameters as do the MRCI and the MPRUS. However, as previously shown, the three components measure different aspects of the patient's functional status.[16,17]

Our results corroborate those of other studies that suggest that pulmonary rehabilitation programs can benefit patients with chronic lung disease.[2,4,7,9,11] While several previous studies have reported a mild increase in the FEV_1 or FVC,[7,8] most are in concert with our findings that spirometric values do not change after rehabilitation.[2,4–6,9–11,14] Many studies report a significant increase in patients' walking distance after pulmonary rehabilitation. Benefits have been noted as early as 6 to 8 weeks,[7,9] may continue for 8 to 12 months,[8] and can be maintained for at least 3 months after training,[7,13] though a recent long-term evaluation after rehabilitation reported a gradual decline in the 6-minute walk distance over a 24-week period following training completion.[11] The studies cited have recruited mostly patients with obstructive lung disease. Our study does include two patients with restrictive lung disease (Patients 12 and 14, Tables 1 and 2); both showed improvement in walking distance and functional status (MDI and MPRUS), but are too few to permit statistical analysis.

Functional status, the impact of the patient's dyspnea on performance of daily activities, has emerged as a separate indicator of clinical response to rehabilitation or to pharmacologic therapy. As emphasized by Feinstein,[20] functional status may be the most clinically germane outcome available, but it has traditionally been spurned as being difficult or impossible to measure reliably. Newly developed

functional status scales, such as the MDI and the Chronic Respiratory Questionnaire,[12] represent instruments that have been developed to retain clinical sensibility and ease-of-use while satisfying testing demands of validity and intra- and interobserver reproducibility.

Measurement of functional status in some studies has shown that bronchodilator therapy can produce functional improvement and decrease dyspnea in patients with chronic obstructive pulmonary disease in the absence of measured increases in airflow,[21,22] and has also shown that improvements in functional status correlate only modestly with increases in walking distances.[16,17,23] The observation that MDI scores correlate most highly with measurements of peak transdiaphragmatic pressure lends support to the notion that dyspnea results from "length-tension inappropriateness" of the respiratory muscles.[24] Furthermore, in the context that aminophylline can increase the force and endurance of diaphragmatic contraction in patients with COPD, the correlation between dyspnea index scores and transdiaphragmatic pressure measurements may explain the observation that aminophylline can improve dyspnea scores without improving airflow in COPD patients.

As the shortcomings of subjective judgments alone and the importance of carefully assessing functional status as a clinical outcome have become more widely appreciated, a number of functional status scales have been proposed. These include scales intended to rate dyspnea alone, such as the Modified Pneumoconiosis Research Unit Score (MPRUS), the Medical Research Council Index (MRCI), the closely-related American Thoracic Society Questionnaire, and the Borg scale. More comprehensive instruments designed to assess any functional impairment resulting from chronic disease include the Baseline and Transitional Dyspnea Indexes, the Oxygen Cost Diagram, the Chronic Respiratory Disease Questionnaire, and the Modified Dyspnea Index.[16]

Many studies to evaluate these newer instruments have compared patient ratings on these scales to more conventional physiologic measures (eg, airflow, oxygenation, diaphragm function, and exercise tolerance) at a single point in time rather than serially. Furthermore, few studies have compared the performance characteristics of different scales, an assessment that is admittedly difficult in the absence of a gold standard for measuring functional status. However, two recent studies are noteworthy exceptions. To assess the benefits of aminophylline on dyspnea, Mahler et al,[21] in a randomized crossover trial using the Baseline Dyspnea Index as an outcome measure, demonstrated that functional status was improved by aminophylline in 12 patients with COPD, despite the absence of any associated improvement in airflow.

A recent study by Guyatt et al[12] has employed several functional status scales (the Baseline Dyspnea Index, a modified MRCI scale, the Oxygen Cost Diagram, and the Chronic Respiratory Disease Questionnaire) to evaluate the efficacy of a pulmonary rehabilitation program. Significant improvement was seen in all four axes of the Chronic Respiratory Disease Questionnaire: dyspnea, emotional function, fatigue, and mastery (feeling of control over disease). Similar improvement was noted in the dyspnea index transition score but not in the other scales. The predicted correlation between the dyspnea axis of the Chronic Respiratory Disease Questionnaire, and the 6-minute walk was good ($r = 0.46$, $p < 0.05$). These findings support our observation that a comprehensive scale like the MDI may be more sensitive to changes in dyspnea than other simpler scales like the MRCI instrument. Our results suggest that the MDI provides a better assessment of functional status than the other dyspnea scales examined. The larger scale allows recognition of subtle changes in functional status that occurred after rehabilitation. No physiologic outcome, including the 6-minute walk distance, correlated with changes in functional status scores.

Several possible methodologic shortcomings of our study require comment. Because the learning effect alone can increase the walking distance by up to 15% after serial trials,[25] two to three practice walks have been advocated before actual measurement of 6-minute walk distance. In addition, the value of encouragement during the walking test has been well established.[26] Although encouragement was given in the current research, practice walks were not performed. However, because the mean increase of 27% in the walking distance surpasses any described increment due to learning effect, it seems unlikely that practice walks would have increased the correlation between the 6-minute walk distance and the dyspnea scores in the current study.

Because our study is observational rather than controlled, we cannot exclude the possibility that

patient expectation of benefit accounts for the functional improvements observed and that the observed benefits are not attributable to the rehabilitation program.

Nevertheless, it would at least appear that increased attention from a number of health care providers can confer functional benefit on patients with chronic lung disease, which itself may be clinically relevant. Furthermore, the lack of a control group would not be expected to confound the comparison among the functional status scales. Too few patients with restrictive lung disease were included in our study to permit a conclusion about the functional benefits of rehabilitation for this specific patient group. However, for both of these patients, improvement in functional status scores was noted after rehabilitation, suggesting that the benefits of rehabilitation may extend to this patient group. Further study is needed before more definitive statements can be made.

Finally, it seems evident that comparison of functional status scores is valid only if each scale is measuring the same symptom. With the inclusion of axes such as the functional impairment and magnitude-of-effort axes in the MDI, the possibility of simply magnifying the score to a larger scale or of scattering the ratings around a baseline magnitude-of-task score exists. However, as is evident in Figures 1 and 2, rather than a random scatter of MDI ratings around a magnitude-of-task score, observed changes in the MDI after rehabilitation were toward improvement, and no decline in MDI scores was seen. Furthermore, it seems unlikely that the MDI scores are simply inflated versions of the MRCI and MPRU scores because each axis of the MDI has been shown to be relatively independent with a rated agreement no higher than 39%.[16]

In Summary

Our study suggests that:

- Pulmonary rehabilitation can enhance walking capacity and functional status in patients with chronic lung disease without augmenting airflow or oxygenation.
- The functional benefits of pulmonary rehabilitation are measurable with indexes of functional status, including the MDI, the MRCI, and the MPRUS.
- The Modified Dyspnea Index appears to be the most sensitive of the three scales for detecting functional improvement during longitudinal evaluation of patients with chronic lung disease.

REFERENCES

1. Moser KM, Bokinsky GE, Savage RT, Archibald CJ, Hansen PR. Results of a comprehensive rehabilitation program. Arch Intern Med 1980;140:1596-1601.
2. Christie D. Physical training in chronic obstructive lung disease. Br Med J 1968;2:150-151.
3. Belman MJ, Krendregan BA. Physical training fails to improve ventilatory muscle endurance in patients with chronic obstructive pulmonary disease. Chest 1982;81:440-443.
4. Nicholas JJ, Gilbert R, Gabe R, Auchincloss JH. Evaluation of an exercise therapy program for patients with chronic obstructive pulmonary disease. Am Rev Respir Dis 1970;102:1-9.
5. Vyas MN, Banister EW, Morton JW, Grzybowski S. Response to exercise in patients with chronic airway obstruction. Am Rev Respir Dis 1971;103:390-400.
6. Paez PN, Phillipson EA, Masangkay M, Sproule BJ. The physiologic basis of training patients with emphysema. Am Rev Respir Dis 1967;95:944-953.
7. Mungall IPF, Hainsworth R. An objective assessment of the value of exercise training to patients with chronic obstructive airways disease. Q J Med 1980;193:77-85.
8. Sinclair DJM, Ingram CG. Controlled trial of supervised exercise training in chronic bronchitis. Br Med J 1980;1:519-521.
9. Cockcroft AE, Saunders MJ, Berry G. Randomized controlled trial of rehabilitation in chronic respiratory disability. Thorax 1981;36:200-203.
10. McGavin CR, Gupta SP, Lloyd EL, McHardy GJR. Physical rehabilitation for the chronic bronchitic: Results of a controlled trial of exercises in the home. Thorax 1977;32:307-311.
11. Guyatt GH, Berman LB, Townsend M. Long-term outcome after respiratory rehabilitation. Can Med Assoc J 1987;137:1089-1095.
12. Guyatt GH, Berman LB, Townsend M, Pugsley SO, Chambers LW. A measure of quality of life for clinical trials in chronic lung disease. Thorax 1987;42:773-778.
13. Holle RHO, Williams DV, Vandree JC, Starks GL, Schoene RB. Increased muscle efficiency and sustained benefits in an outpatient community hospital-based pulmonary rehabilitation program. Chest 1988;94:1161-1168.
14. Degre S, Sergtsels R, Messin R, et al. Hemodynamic responses to physical training in patients with chronic lung disease. Am Rev Respir Dis 1974;110:395-402.
15. Medical Research Council. Committee on research into chronic bronchitis. Instructions for the use of the

questionnaire on respiratory symptoms. Devon, England: WJ Holman, 1966.
16. Stoller JK, Ferranti R, Feinstein AR. Further specification and evaluation of a new clinical index for dyspnea. Am Rev Respir Dis 1986;134:1129-1134.
17. Mahler DA, Weinberg DH, Wells CK, Feinstein AR. The measurement of dyspnea: Contents, interobserver agreement, and physiologic correlates of two new clinical indexes. Chest 1984;85:751-758.
18. American Thoracic Society. Recommended respiratory disease questionnaires for use with adults and children in epidemiologic research. Am Rev Respir Dis 1978;118 (Suppl):7-52.
19. Kramer MS, Feinstein AR. Clinical biostatistics: LIV. The biostatistics of concordance. Clin Pharm Ther 1981;29:111-123.
20. Feinstein AR, Josephy BR, Wells CK. Scientific and clinical problems in indexes of functional disability. Ann Intern Med 1986;105:413-420.
21. Mahler DA, Matthay RA, Snyder PE, Wells CK, Loke J. Sustained-release theophylline reduces dyspnea in irreversible obliterative airways disease. Am Rev Respir Dis 1985;131:22-25.
22. Guyatt GH, Townsend M, Pugsley SO, et al. Bronchodilators in chronic air flow limitation. Effects on airway function, exercise capacity, and quality of life. Am Rev Respir Dis 1987;135:1069-1074.
23. McGavin CR, Artvinli M, Naoe H, McHardy GJR. Dyspnea, disability, and distance walked: Comparison of estimates of exercise performance in respiratory disease. Br Med J 1978;2:241-243.
24. Campbell EJM, Howell JBL. The sensation of breathlessness. Br Med Bull 1963;19:36-40.
25. Guyatt GH. The use of the six-minute walk test as an outcome measure in clinical trials in chronic heart failure. Heart Failure 1987;Oct/Nov:211-217.
26. Guyatt GH, Pugsley SO, Sullivan MJ, et al. Effect of encouragement on walking test performance. Thorax 1984;39:818-822.

APPENDIX 1

(Stoller JK, Ferranti R, Feinstein AR. Further specification and evaluation of a new clinical index for dyspnea. Am Rev Respir Dis 1986;134:1129-1134.)

The Modified Dyspnea Index: Rating Criteria

I. Criteria for Grade Assignment: Functional Impairment at Work

Grade 4: No Impairment. The patient is able to carry out usual job-related activities without shortness of breath. To be classified as Grade 4, the patient should:

(a) *not* have changed jobs or job activities as a result of shortness of breath.

(b) *not*, for reasons of shortness of breath, have decreased the amount of hours/week (s)he works, or curtailed any job-related activities because they were too strenuous, either by eliminating certain tasks in the same job or by changing jobs to a less physically demanding one.

Grade 3: Slight Impairment. The patient recognizes that shortness of breath has caused him/her to alter job activities.

Although no job responsibilities have been completely abandoned as a result of shortness of breath, at least one job-related task is done more slowly due to shortness of breath.

Grade 2: Moderate Impairment. The patient has:

(a) maintained the same job and same hours/week as before the onset of dyspnea but, because of shortness of breath, has abandoned completely at least one of the tasks (s)he had done as part of that job, or

(b) changed jobs to a less strenuous position, because shortness of breath interfered with job activities, or

(c) maintained his/her previous job (eg, the job (s)he had before dyspnea began), but decreased the number of hours/week worked at that job.

Categories (b) and (c) are not mutually exclusive, as when the patient decreases the amount of hours on one job but adds a second, less strenuous job for financial reasons. This situation is also coded as Grade 2.

Grade 1: Severe Impairment. The patient no longer works because of shortness of breath. This category would include:

(a) Patients who have retired *early* from their job because of shortness of breath and who, despite a desire to work, have not found a realistically limited job because of shortness of breath.

(b) Patients who reached expected retirement age and stopped working and who also have dyspnea are graded according to how their shortness of breath affected their job *before* retiring. *Example:* A construction worker who left the work crew to take a desk job because of shortness of breath and who has now reached retirement age would be assigned Grade 2 for "functional impairment at work" rather than Grade 1.

W: *Amount Uncertain.* Patient is impaired due to shortness of breath, but amount cannot be specified because details are not sufficient.

X: *Unknown.* Information unavailable.

Y: *Impaired for Reasons Other than Shortness of Breath.* Grade Y is assigned if the patient has a main limitation due to a disability *other* than shortness of breath, eg, chest pain, hip disease, or some other musculoskeletal impairment.

Please describe the nature of the other limiting condition(s):_____

Z: The patient has not had a job since before symptoms of shortness of breath began and has not since sought work.

Example: A non-breadwinner who had not intended to find a job even before shortness of breath began.

For patients who were not working when their shortness of breath began but who have since begun to work and found shortness of breath to be a factor in determining their job, code as Grade 2.

II. Criteria for Grade Assignment: Functional Impairment at Home

Grade 4: No Impairment. The patient is able to carry out usual home activities without shortness of breath; there is no curtailment of the number or type of home activities, and no reduction in the pace with which the activities are done.

Grade 3: Slight Impairment. The patient recognizes that shortness of breath has caused him/her to alter the usual home activities in any of the following way(s):

(a) Although no usual activities have been completely abandoned as a result of shortness of breath, up to several (but *not all*) activities are done more slowly.

(b) Although the patient continues all his/her activities, at least one activity may be done less frequently as a result of shortness of breath.

Example: A devoted baseball fan who, on account of shortness of breath, now goes only to an occasional game rather than his previous pattern of going to every one would be graded as having slight impairment (Grade 3) in functional impairment at home.

Grade 2: Moderate Impairment. Shortness of breath has caused the patient to curtail activities in at least one of the following ways:

(a) up to several (but *not all*) activities have been *completely abandoned* because of shortness of breath, and/or

(b) most or all usual activities are done more slowly because of shortness of breath.

Example: A patient attended the theater regularly before the onset of dyspnea but no longer attends because of his pulmonary disability. Because he still maintains his woodworking hobby at home, however, (even though he uses the tools more slowly) he should be assigned Grade 2.

Grade 1: Severe Impairment. Shortness of breath has caused the patient to abandon most or all of his/her usual activities.

Examples would include:

(a) The patient who is too breathless to leave the house without assistance.

(b) The patient who, as a result of shortness of breath, has come to depend on a spouse or assistant to take over the tasks of shopping, cooking, and cleaning, and who may even need help in dressing or bathing.

W: *Amount Uncertain.*

X: *Unknown.*

Y: *Impaired for Reasons Other than Shortness of Breath.*

Please describe the nature of this other limiting condition(s):_____

_____

_____

III. Instructions for Assigning Composite Functional Grade

Work Functional Grade	Home Functional Grade	Composite Functional Grade
2, 3, or 4	2, 3, or 4	The lower grade in either "work" or "home" category becomes the composite grade; for identical grades in "work" and "home" categories, the composite grade is that same grade.
1	2, 3, or 4	
2, 3, or 4	1	Assign composite grade as Grade 1, or severe impairment.
1	1	Assign composite grade as Grade 0, or very severe impairment. Recipients of Grade 0 will no longer be working due to shortness of breath (ie, functional Grade 1 on work) and will be severely impaired in their usual home activities.
2, 3, or 4	W, X, or Y	Assign the work functional grade as the composite grade.
W, X, Y, or Z	1, 2, 3, or 4	Assign the home functional grade as the composite grade.
W, X, Y, or Z	W, X, or Y	Assign as a composite grade the two letter combination (in order with "work" grade first) of each of the individual grades; ie, "work" grade W and "home" grade X would be composite grade WX, etc.

IV. Criteria for Grade Assignment: Magnitude of Task

Grade 4: Extraordinary. Becomes short of breath only with extraordinary activity, such as:
—carrying very heavy loads on the level
—carrying lighter loads upstairs
—running.

Grade 3: Major. Becomes short of breath only with major activities, such as
—walking up a steep hill
—climbing *two* flights of stairs *or more*
—carrying a *heavy* bag of groceries on the level.

Grade 2: Moderate. Becomes short of breath with moderate or average tasks, such as:
—climbing up stairs up to *two* flights
—walking up a gradual hill
—walking briskly on the level
—carrying a light load on the level.

Grade 1: Light. Becomes short of breath with light activities, such as:
—walking on level with others of the same age
—walking to the bathroom in residence
—washing up
—dressing
—shaving.

Grade 0: No Task. Becomes short of breath with no activity, as:
—while sitting and/or lying down
—while standing motionless.

W: *Amount Uncertain.*

X: *Unknown.*

Y: *Impaired for Reasons Other than Shortness of Breath.*

Please describe the nature of this other limiting condition(s):_____

_____

_____

V. Criteria for Grade Assignment: Magnitude of Effort

For the most strenuous task the patient can perform (for at least five minutes):

Grade 4: It is done *briskly* without pausing because of shortness of breath or even slowing down to rest.

Grade 3: It is done *slowly* but without pausing or stopping to catch breath.

Grade 2: It is done *slowly* and still with rare pauses (one or two) to catch breath before completing the task or quitting altogether.

Grade 1: It is done *slowly* and with many stops or pauses before the task is completed or abandoned.

Grade 0: The patient is short of breath at rest, or while sitting, or lying down.

W: *Amount Uncertain.*

X: *Unknown.*

Y: *Impaired for Reasons Other than Shortness of Breath.*

Please describe the nature of this other limiting condition(s):_____

_____

_____

Note that the condition other than breathlessness that limits the patient's most strenuous condition need not be the same disability that limits the other activities described in this questionnaire. For example, the patient whose angina only occurs with strenuous activity may have little functional limitation at a sedentary job (Grade 4 for "functional impairment at work") but be limited in his/her most strenuous activity by angina (Grade Y on "magnitude of effort": chest pain).

APPENDIX 2

(Medical Research Council. Committee on research into chronic bronchitis. Instructions for use of the questionnaire on respiratory symptoms. Devon, England: WJ Holman, 1966.)

Medical Research Council Index

Grading of Dyspnea	
Grade I	Dyspnea on vigorous effort only.
Grade II	Troubled by inclines or when hurrying on level ground.
Grade III	Short of breath walking with others of similar age and physique, even on level ground, but can walk a mile slowly, do own shopping.
Grade IV	Short of breath with mild activities; cannot walk one block or climb one flight of stairs without stopping for breath.

APPENDIX 3

(Stoller JK, Ferranti R, Feinstein AR. Further specification and evaluation of a new clinical index for dyspnea. Am Rev Respir Dis 1986;134:1129-1134.)

The Modified Pneumoconiosis Research Unit Score: Criteria for Assigning Ratings

Grade 1: Is the patient's breath as good as that of other people of own age and build at work, on walking, and on climbing hills or stairs?

Grade 2: Is the patient able to walk with normal people of own age and build on the level, but unable to keep up on hills or stairs?

Grade 3: Is the patient unable to keep up with normal people on the level, but able to walk about a mile or more at his/her own speed?

Grade 4: Is the patient unable to walk more than about 100 yards on the level without a rest?

Grade 5: Is the patient breathless on talking or undressing, or unable to leave the house because of breathlessness?

Contributions to this section welcome. Send double-spaced typed material (and illustrations if pertinent) to Historical Notes, RESPIRATORY CARE, PO Box 29686, Dallas TX 75229. Identify source of material and include your name, credentials, and address.

Medicated Atmospheres (Inhalation Therapy in the 1800s)

Atmospheres naturally or artificially impregnated with medicinal agents are frequently prescribed for the treatment of affections of the respiratory organs, and sometimes for the treatment of other affections also. The patient either resides permanently, or for a time, in the medicated atmosphere, or else passes a certain number of hours a day in it.

Among the ancients, Aretaeus, Celsus, and the elder Pliny recommended sea-air in consumption, and Pliny likewise recommended residence in pine-forests as more beneficial than a trip to Egypt, or a course of milk in the mountains. Galen sent patients with phthisis (TB) and laryngeal and tracheal ulcerations not only to reside on the seacoast, but also to the vicinity of Mounts Vesuvius and Aetna that they might breathe an atmosphere impregnated with sulphurous emanations. From time to time, similar atmospheres have been recommended in various chronic diseases of the respiratory organs; where the natural atmospheres were out of reach, artificial substitutes have been resorted to. Thus, "aspiratory chambers" have been found in the remains of many Roman baths.

Nicolas Piso (1527-1579) recommended hot dry air in consumption (TB), and mentioned a case of recovery in a female, in consequence of her attendance on a bakehouse.

Bennett, of London (1654), expressed the belief that by the use of suitable vapors of medicated effluvia, sitting apartments might be made useful substitutes for voyages to Egypt and other warm countries.

Atmospheres impregnated with the fine dust of fresh earth in suspension, as first recommended by Solano, of Luque, in the form of the earth-bath, were considered as possibly salubrious by Van Switen, and were recommended by Fouguet, Hufeland, and others in phthisis. They are still employed at Ischl and other resorts on the European continent. Demarquay believed that the beneficial effects of the emanations from earth-baths are due to the carbonic acid of which they are in great part composed.

Residence in the immediate vicinity of cowhouses, stables, and the like, or even in apartments directly communicating with them, so that the atmosphere breathed by the patient should be continuously impregnated with the warm ammoniacal emanations from the animal exhalations, was highly recommended in phthisis by Read, Beddoes, and others, in the latter part of the eighteenth century. The beneficial results were at first attributed to animal exhalations. Fourcroy, however, shrewdly suspected that they were

This is an abridgement of a section of the book, "Inhalation in the Treatment of Disease: Its Therapeutics and Practice," written by J Solis Cohen MD and published in 1876 at Philadelphia by Lindsay & Blakiston. It was made available to this journal by Joy Cregg RN RRT, who is Chief, Respiratory Care and Pulmonary Function Laboratory, James Haley VA Hospital, Tampa, Florida.

rather due to reduction of the purity of the atmosphere, which might be too rich in oxygen, while Beddoes attributed them to the uniform warmth of the atmosphere.

In a similar manner, sojourn or residence in sugar manufactories was recommended in consumption by Beddoes and others, for the sake of the carbonic acid with which their atmosphere is impregnated.

The warm vapors from tanneries were recommended by Elliotson and others—and the list might be further increased. In the foregoing pages of this book, mention has been made of atmospheres artificially impregnated with aromatics, balsam, bromine, camphor, carbolic acid, carbonic acid, carburetted hydrogen, chloride of copper, chloride of ammonium, chlorine, hydrogen, iodine, oil, ozone, resins, salt, sulphur, sulphetted hydrogen, tar, turpentine, and vapor of water.

The experiments of Laennec to produce an artificial sea-air for consumptive patients, though not promising in their results, have been imitated by others, but in a different manner. Thus Hirzel, of Zurich, sprinkled an artificial sea-water from a small fountain, in the apartments of consumptive patients. Then, there are establishments in which salt-water sprays are continuously projected into the atmosphere to which patients resort at certain hours of the day, remaining in the atmosphere for an hour or so at a time. One example will suffice:

At Reichenhall, a celebrated cure in Bavaria, a method of treatment is adopted in which the patient lounges in the immediate neighborhood of the drying-houses near enormous hedges, forty or fifty feet high, composed of bundles of twigs arranged horizontally, so that their projecting ends form the surface of the wall. The water is conveyed to these hedges by pipes, and is allowed to trickle over the bundles of twigs into reservoirs, whence it is conveyed into vats and undergoes further evaporation by the aid of heat. The air is richer in suspended particles (0.054-0.123 grains in the cubic foot) than sea-air is. The researches of Prof. Vogel and Dr von Liebig show that about ten grains of salt are actually taken into the respiratory apparatus in the hour, which is only two grains less than the amount taken in when the water is nebulized into spray in the inhalation rooms of the cure. Dr Sanderson believes that the beneficial results of the saline atmospheres are due to their effect in increasing the tendency to molecular disintegration, ie, to oxidations throughout the body. These inhalations are of great value in chronic catarrhal affections of the digestive and respiratory mucous membranes.

In cases of infective and contageous diseases, and under other circumstances in which it is desirable to prevent contamination of the atmosphere with the emanations from a patient or his discharges, or when it is desirable to disinfect an atmosphere already so tainted, we have a ready means of diffusing a purifying agent through the atmosphere of an apartment, by resorting to the process of nebulization, so as to divide it in the most minute manner possible. In this manner, one or more instruments can be placed in action in different portions of the room, and kept up sufficiently to maintain a comparatively pure atmosphere.

Then, also, in cases of disease where we wish to medicate the atmosphere with which the patient is surrounded, as with a terebinthinate or other impregnation, or simply to supply moisture, or to create an artificial sea-air, we can place one or more instruments in convenient localities and keep up such a medication as is required, or renew it at proper intervals. So, too, in cases where patients are too feeble to make any effort at inhalation, and where it is impossible or imprudent to call their attention to the process, an instrument may be set in close proximity to them in such a manner that a portion of the air they inspire shall contain more or less of the nebula.

Mention has been made (earlier in the book) of the diseases to which certain classes of laborers are subjected from breathing the dust accumulating in the atmospheres in which they are working. Attempts have been

made at times to prevent the inhalation of these dusts. Pliny (A.D. 23-79) mentions that workers in mines fastened bladders before their mouths, and that Roman bakers placed cloths in front of their faces, when working in atmospheres loaded with these dusts.

Of late years respirators with metallic meshes small enough to detain the deleterious particles of dust have been recommended to be worn over the mouth and nose during exposure to the injurious atmosphere. They are sometimes packed with raw cotton, which detains fine particles which pass through the meshes, while it still permits the access of air. Similar contrivances, impregnated with disinfectant solutions, are sometimes employed during exposure to poisonous atmospheres.

It is often found that patients with phthisis, chronic bronchitis, or even only with delicate respiratory mucous membrane, are unable to face the open air on inclement and windy days. Sometimes patients are unable to withstand the changes of temperature, even on days that promise to be pleasant. Under such circumstances they are obliged to keep to the house, or to muffle the mouth and nose with a handkerchief, veil, or something of that kind when they go out into the open air. The temperature of the air is modified by the warmth of the comforter, maintained by the air of expiration, while at the same time, if too rich in oxygen, its pungency is moderated. These appliances are unsightly, but their use often enables patients to take regular outdoor exercise, in carriage or on foot, instead of being compelled to remain indoors almost constantly.

In 1848 Sales-Girons suggested the regularly supplying diseased lungs with a respiratory pabulum, suitable to their condition, on similar grounds to those defining suitable diet in diseases of the digestive organs, and this he called a "respiratory diet." Some resin, tar, or balsam &c. was placed within a respirator, to be worn in front of the patient's mouth, thus keeping him in a medicated atmosphere all day long, without confining him to one locality, and enabling him even to attend to his business without exposure to the unmitigated oxygen of the atmosphere, often prejudicial in many cases of diseases of the pulmonary organs.

After several years, Sales-Girons still maintains (Gazette hebdomadaire, February 17th, 1860, p. 108) that respiration is susceptible of diet as easily as digestion; and for the purpose of supplying this diet he employs various substances, which the patient carries about with him the greater part of the day, applied over the mouth and nostrils. He contends that the respiratory diet is in accordance with a theory of relations between the living organism and the atmosphere, or the theory of relations of the lungs with oxygen.

In the discussion which ensued at the Parisian Academy of Medicine, upon Bouillard's report upon the work of Sales-Girons, M. Fontan put the query whether there was not in this production of Sales-Girons the germ of a grand discovery, that of a third state of oxygen, oxygen negatively electric, or sub-oxygen, in contradistinction to oxygen positively electric, ozone or sur-oxygen, and ordinary oxygen or neutral oxygen?

According to Prof. Dickson (Elements of Medicine, Philadelphia, 1855, p. 624), we would anticipate some soothing influence from the inspiration of air made to contain a less quantity of oxygen, which is generally regarded as a stimulant. He refers, however, to atmospheric mixtures with nitrogen and hydrogen, and with carbonic oxide or carbonic acid, and accounts in this way for the advantages said to have been derived by some consumptives from residing in stables with cattle, so much in vogue in England in the time of Darwin and Beddoes.

In certain cases of phthisis and chronic bronchitis, where it is impracticable or injudicious to send the patient to a warm and equable climate during the winter, much benefit will often accrue from imitating the climate artificially at home. Two well-ventilated communicating rooms may be suitably warmed, and kept constantly at a uniform temperature, and the atmosphere

"I never thought we could be hit...
I mean, I knew it was possible,
but what were the chances?"

RSV.
No one knows the path it will take.

The consequences may have a lasting effect. The short-term consequences of respiratory syncytial virus (RSV) infection can include nosocomial spread, mechanical ventilation, extended hospitalization—even death—and can threaten *all* hospitalized children under 4 years old. Respiratory viral infections may have a long-term effect on the respiratory tree in some patients, such as development of bronchopulmonary disease.[1]

Help reduce the toll taken by RSV. In clinical experience with over 50,000 patients, treatment of appropriate patients with Virazole® (ribavirin) Aerosol improved disease symptoms safely, speeding recovery[2-6] while significantly reducing viral shedding.[2,4] Virazole may reduce the need for supplemental oxygen and mechanical ventilation.[7] And Virazole has been shown to prevent development of RSV-specific IgE responses,[8] which may correlate with the release of histamine and clinical expression of obstructive reactive airway disease.[1]

Serious enough to hospitalize, serious enough to consider

Virazole®
(ribavirin)
Lyophilized for aerosol administration

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Please see following page for full prescribing information.

STI-132

Serious enough to hospitalize, serious enough to consider

Virazole®
(ribavirin)

lyophilized for aerosol administration

PRESCRIBING INFORMATION

WARNING: RIBAVIRIN AEROSOL SHOULD NOT BE USED FOR INFANTS REQUIRING ASSISTED VENTILATION BECAUSE PRECIPITATION OF THE DRUG IN THE RESPIRATORY EQUIPMENT MAY INTERFERE WITH SAFE AND EFFECTIVE VENTILATION OF THE PATIENT. Conditions for safe use with a ventilator are still in development.

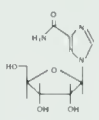
Deterioration of respiratory function has been associated with ribavirin use in infants, and in adults with chronic obstructive lung disease or asthma. Respiratory function should be carefully monitored during treatment. If initiation of ribavirin aerosol treatment appears to produce sudden deterioration of respiratory function, treatment should be stopped and re-instituted only with extreme caution and continuous monitoring.

Although ribavirin is not indicated in adults, the physician should be aware that it is teratogenic in animals (see CONTRAINDICATIONS).

DESCRIPTION:

Virazole® (ribavirin) Aerosol, an antiviral drug, is a sterile, lyophilized powder to be reconstituted for aerosol administration. Each 100 ml glass vial contains 6 grams of ribavirin, and when reconstituted to the recommended volume of 300 ml with sterile water for injection or sterile water for inhalation (no preservatives added), will contain 20 mg/ml ribavirin, pH approximately 5.5. Aerosolization is to be carried out in a SPAG-2 nebulizer only.

Ribavirin is 1-beta-D-ribofuranosyl-1,2,4-triazole-3-carboxamide, with the following structural formula:



Ribavirin, a synthetic nucleoside, is a stable, white, crystalline compound with a maximum solubility in water of 142 mg/ml at 25°C and with only a slight solubility in ethanol. The empirical formula is $C_8H_{12}N_4O_5$ and the molecular weight is 244.2 Daltons.

CLINICAL PHARMACOLOGY:

Antiviral effects:

Ribavirin has antiviral inhibitory activity *in vitro* against respiratory syncytial virus,[1] influenza virus, and herpes simplex virus. Ribavirin is also active against respiratory syncytial virus (RSV) in experimentally infected cotton rats.[2]

In cell cultures, the inhibitory activity of ribavirin for RSV is selective. The mechanism of action is unknown. Reversal of the *in vitro* antiviral activity by guanosine or xanthosine suggests ribavirin may act as an analogue of these cellular metabolites.

Immunologic effects:

Neutralizing antibody responses to RSV were decreased in ribavirin treated compared to placebo treated infants.[3] The clinical significance of this observation is unknown. In rats, ribavirin resulted in lymphoid atrophy of thymus, spleen, and lymph nodes. Humoral immunity was reduced in guinea pigs and ferrets. Cellular immunity was also mildly depressed in animal studies.

Microbiology:

Several clinical isolates of RSV were evaluated for ribavirin susceptibility by plaque reduction in tissue culture. Plaques were reduced 85-98% by 16 μg/ml, however, plaque reduction varies with the test system. The clinical significance of these data is unknown.

Pharmacokinetics:

Assay for ribavirin in human materials is by a radioimmunoassay which detects ribavirin and at least one metabolite.

Ribavirin administrered by aerosol is absorbed systemically. Four pediatric patients inhaling ribavirin aerosol administered by face mask for 2.5 hours each day for 3 days had plasma concentrations ranging from 0.44 to 1.55 μM, with a mean concentration of 0.76 μM. The plasma half-life was reported to be 9.5 hours. Three pediatric patients inhaling ribavirin aerosol administered by face mask or mist tent for 20 hours each day for 5 days had plasma concentrations ranging from 1.5 to 14.3 μM, with a mean concentration of 6.8 μM.

It is likely that the concentration of ribavirin in respiratory tract secretions is much higher than plasma concentrations in view of the route of administration.

The bioavailability of ribavirin aerosol is unknown and may depend on the mode of aerosol delivery. After aerosol treatment, peak plasma concentrations are less than the concentration that reduced RSV plaque formation in tissue culture by 8.5 to 98%. After aerosol treatment, respiratory tract secretions are likely to contain ribavirin in concentrations many fold higher than those required to reduce plaque formation. However, RSV is an intracellular virus and serum concentrations may better reflect intracellular concentrations in the respiratory tract than respiratory secretion concentrations.

In man, rats, and rhesus monkeys, accumulation of ribavirin and/or metabolites in the red blood cells has been noted, plateauing in red cells in man in about 4 days and gradually declining with an apparent half-life of 40 days. The extent of accumulation of ribavirin following inhalation therapy is not well defined.

INDICATIONS AND USAGE:

Ribavirin aerosol is indicated in the treatment of carefully selected hospitalized infants and young children with severe lower respiratory tract infections due to respiratory syncytial virus (RSV). In two placebo-controlled trials in infants hospitalized with RSV lower respiratory tract infection, ribavirin aerosol treatment had a therapeutic effect, as judged by the reduction by treatment day 3 of severity of clinical manifestations of disease.[3,4] Virus titers in respiratory secretions were also significantly reduced with ribavirin in one of these studies.[4]

Only severe RSV lower respiratory tract infection is to be treated with ribavirin aerosol. The vast majority of infants and children with RSV infection have no lower respiratory tract disease or have disease that is mild, self-limited, and does not require hospitalization or antiviral treatment. Many children with mild lower respiratory tract involvement will require shorter hospitalization than would be required for a full course of ribavirin aerosol (3 to 7 days) and should not be treated with the drug. Thus the decision to treat with ribavirin aerosol should be based on the severity of the RSV infection.

The presence of an underlying condition such as prematurity or cardiopulmonary disease may increase the severity of the infection and its risk to the patient. High risk infants and young children with these underlying conditions may benefit from ribavirin treatment, although efficacy has been evaluated in only a small number of such patients.

Ribavirin aerosol treatment must be accompanied by and does not replace standard supportive respiratory and fluid management for infants and children with severe respiratory tract infection.

Diagnosis:

RSV infection should be documented by a rapid diagnostic method such as demonstration of viral antigen in respiratory tract secretions by immunofluorescence[3,4] or ELISA[5] before or during the first 24 hours of treatment. Ribavirin aerosol is indicated only for lower respiratory tract infection due to RSV. Treatment may be initiated while awaiting rapid diagnostic test results. However, treatment should not be continued without documentation of RSV infection.

CONTRAINDICATIONS:

Ribavirin is contraindicated in women or girls who are or may become pregnant during exposure to the drug. Ribavirin may cause fetal harm and respiratory syncytial virus infection is self-limited in this population. Ribavirin is not completely cleared from human blood even four weeks after administration. Although there are no pertinent human data, ribavirin has been found to be teratogenic and/or embryolethal in nearly all species in which it has been tested. Teratogenicity was evident after a single oral dose of 2.5 mg/kg in the hamster and after daily oral doses of 10 mg/kg in the rat. Malformations of skull, palate, eye, jaw, skeleton, and gastrointestinal tract were noted in animal studies. Survival of fetuses and offspring was reduced. The drug causes embryolethality in the rabbit at daily oral dose levels as low as 1 mg/kg.

WARNINGS:

Ribavirin administered by aerosol produced cardiac lesions in mice and rats after 30 and 36 mg/kg, respectively, for 4 weeks, and after oral administration in monkeys at 120 and rats at 154 to 200 mg/kg for 1 to 6 months. Ribavirin aerosol administered to developing ferrets at 60 mg/kg for 10 or 30 days resulted in inflammatory and possible emphysematous changes in the lungs. Proliferative changes were seen at 131 mg/kg for 30 days. The significance of these findings to human administration is unknown.

Ribavirin lyophilized in 6 gram vials is intended for use as an aerosol only.

PRECAUTIONS:

General:

Patients with lower respiratory tract infection due to respiratory syncytial virus require optimum monitoring and attention to respiratory and fluid status.

Drug Interactions:

Interactions of ribavirin with other drugs such as digoxin, bronchodilators, other antiviral agents, antibiotics, or antimetabolites has not been evaluated. Interference by ribavirin with laboratory tests has not been evaluated.

Carcinogenesis, mutagenesis, impairment of fertility:

Ribavirin induces cell transformation in an *in vitro* mammalian system (Balb/C3T3 cell line). However, *in vivo* carcinogenicity studies are incomplete. Results thus far, though inconclusive, suggest that chronic feeding of ribavirin to rats at dose levels in the range of 16-60 mg/kg body weight can induce benign mammary, pancreatic, pituitary and adrenal tumors.

Ribavirin is mutagenic to mammalian (L5178Y) cells in culture. Results of microbial mutagenicity assays and a dominant lethal assay (mouse) were negative.

Ribavirin causes testicular lesions (tubular atrophy) in adult rats at oral dose levels as low as 16 mg/kg/day (lower doses not tested), but fertility of ribavirin-treated animals (male or female) has not been adequately investigated.

Pregnancy:

Teratogenic Effects: Pregnancy Category X. See "Contraindications" section.

Nursing Mothers: Use of ribavirin aerosol in nursing mothers is not indicated because RSV infection is self-limited in this population. Ribavirin is toxic to lactating animals and their offspring. It is not known whether the drug is excreted in human milk.

ADVERSE REACTIONS:

Approximately 200 patients have been treated with ribavirin aerosol in controlled or uncontrolled clinical studies.

Pulmonary function significantly deteriorated during ribavirin aerosol treatment in six of six adults with chronic obstructive lung disease and in four of six asthmatic adults. Dyspnea and chest soreness were also reported in the latter group. Minor abnormalities in pulmonary function were also seen in healthy adult volunteers.

Several serious adverse events occurred in severely ill infants with life threatening underlying diseases, many of whom required assisted ventilation. The role of ribavirin aerosol in these events is indeterminate. The following events were associated with ribavirin use:

Pulmonary: Worsening of respiratory status, bacterial pneumonia, pneumothorax, apnea, and ventilator dependence.

Cardiovascular: Cardiac arrest, hypotension, and digitalis toxicity.

There were 7 deaths during or shortly after treatment with ribavirin aerosol. No death was attributed to ribavirin aerosol by the investigators.

Some subjects requiring assisted ventilation have experienced serious difficulties, which may jeopardize adequate ventilation and gas exchange. Precipitation of drug within the ventilatory apparatus, including the endotracheal tube, has resulted in increased positive end expiratory pressure and increased positive inspiratory pressure. Accumulation of fluid in tubing ("rain out") has also been noted.

Although anemia has not been reported with use of the aerosol, it occurs frequently with oral and intravenous ribavirin, and most infants treated with the aerosol have not been evaluated 1 to 2 weeks post-treatment when anemia is likely to occur. Reticulocytosis has been reported with aerosol use.

Rash and conjunctivitis have been associated with the use of ribavirin aerosol.

Overdosage:

No overdosage with ribavirin by aerosol administration has been reported in the human. The LD_{50} in mice is 2 gm orally. Hypoactivity and gastrointestinal symptoms occurred. In man, ribavirin is sequestered in red blood cells for weeks after dosing.

DOSAGE AND ADMINISTRATION

Before use, read thoroughly the Viratek Small Particle Aerosol Generator (SPAG) Model SPAG-2 Operator's Manual for small particle aerosol generator operating instructions.

Treatment was effective when instituted within the first 3 days of respiratory syncytial virus lower respiratory tract infection.[3] Treatment early in the course of severe lower respiratory tract infection may be necessary to achieve efficacy.

Treatment is carried out for 12-18 hours per day for at least 3 and no more than 7 days, and is part of a total treatment program. The aerosol is delivered to an infant oxygen hood from the SPAG-2 aerosol generator. Administration by face mask or oxygen tent may be necessary if a hood cannot be employed (see SPAG-2 manual). However, the volume of distribution and condensation area are larger in a tent and efficacy of this method of administering the drug has been evaluated in only a small number of patients. Ribavirin aerosol is not to be administered with any other aerosol generating device or together with other aerosolized medications. Ribavirin aerosol should not be used for patients requiring simultaneous assisted ventilation (see 8oxed Warnings).

Virazole is supplied as 6 grams of lyophilized drug per 100 ml vial for aerosol administration only. By sterile technique, solubilize drug with sterile USP water for injection or inhalation in the 100 ml vial. Transfer to the clean, sterilized 500 ml widemouth Erlenmeyer flask (SPAG-2 Reservoir) and further dilute to a final volume of 300 ml with sterile USP water for injection or inhalation. The final concentration should be 20 mg/ml. **Important:** This water should not have had any antimicrobial agent or other substance added. The solution should be inspected visually for particulate matter and discoloration prior to administration. Solutions that have been placed in the SPAG-2 unit should be discarded at least every 24 hours and when the liquid level is low before adding newly reconstituted solution.

Using the recommended drug concentration of 20 mg/ml ribavirin as the starting solution in the drug reservoir of the SPAG unit, the average aerosol concentration for a 12 hour period would be 190 micrograms/liter (0.19 mg/l) of air.

HOW SUPPLIED:

Virazole® (ribavirin) Aerosol is supplied in 100 ml glass vials with 6 grams of sterile, lyophilized drug which is to be reconstituted with 300 ml sterile water for injection or sterile water for inhalation (no preservatives added) and administered only by a small particle aerosol generator (SPAG-2). Vials containing the lyophilized drug powder should be stored in a dry place at 15-25°C (59-78°F). Reconstituted solutions may be stored, under sterile conditions, at room temperature (20-30°C, 68-86°F) for 24 hours. Solutions which have been placed in the SPAG-2 unit should be discarded at least every 24 hours.

REFERENCES:

1. Hruska JF, Bernstein JM, Douglas Jr., RG, and Hall CB: Effects of ribavirin on respiratory syncytial virus *in vitro*. *Antimicrob Agents Chemother* 1980;17:770-775.
2. Hruska JF, Morrow PE, Suffin SC and Douglas Jr., RG: *In vivo* inhibition of respiratory syncytial virus by ribavirin. *Antimicrob Agents Chemother* 1982;21:125-130.
3. Taber LH, Knight V, Gilbert BE, McClung HW et al: Ribavirin aerosol treatment of bronchiolitis associated with respiratory tract infection in infants. *Pediatrics* 1983;72:613-618.
4. Hall CB, McBride JT, Walsh EE, Bell DM et al: Aerosolized ribavirin treatment of infants with respiratory syncytial viral infection. *N Engl J Med* 1983;308:1443-7.
5. Hendry RM, McIntosh K, Fahnestock ML, and Pierik LT: Enzyme-linked immunosorbent assay for detection of respiratory syncytial virus infection. *J Clin Microbiol* 1982;16:329-33.

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ADVERTISEMENT REFERENCES:

1. Ogra PL: Allergy, respiratory tract infections and bronchial hyperreactivity. *Pediatr Infect Dis J* 1989;8:347-352.
2. Hall CB, McBride JT, Gala CL, Hildreth SW, Schnabel KC: Ribavirin treatment of respiratory syncytial viral infection in infants with underlying cardiopulmonary disease. *JAMA* 1985;254:3047-3051.
3. Conrad DA, Christenson JC, Waner JL, Marks MI: Aerosolized ribavirin treatment of respiratory syncytial virus infection in infants hospitalized during an epidemic. *Pediatr Infect Dis J* 1987;6:152-158.
4. Hall CB, McBride JT, Walsh EE, et al: Aerosolized ribavirin treatment of infants with respiratory syncytial viral infection: a randomized double-blind study. *N Engl J Med* 1983;308:1443-1447.
5. Taber LH, Knight V, Gilbert BE, et al: Ribavirin aerosol treatment of bronchiolitis associated with respiratory syncytial virus infection in infants. *Pediatrics* 1983;72:613-618.
6. Data on file, ICN Pharmaceuticals, Inc.
7. Spinelli M, Geraci-Ciardullo K, Palumbo PE, Laskin O, Edelson PJ: Efficacy of ribavirin for treating respiratory syncytial virus (RSV) pneumonia in high-risk infants. *Pediatr Res* 1985;19:304A Abstract.
8. Rosner IK, Welliver RC, Edelson PJ, Geraci-Ciardullo K, Sun M: Effect of ribavirin therapy on respiratory syncytial virus-specific IgE and IgA responses after infection. *J Infect Dis* 1987;155:1043-1047.

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may be impregnated with resinous emanations from pine saplings in the sitting apartment, or may be otherwise medicated. In these rooms the patient should live. At certain hours of the day, when the outer atmosphere is warmest, say between twelve and two o'clock in the day, the patient can put on hat and over-clothing, as for a walk in the streets, and promenade the rooms for half an hour or longer, the windows being freely opened to secure an ample supply of fresh air during the exercise. In this manner the benefits of equable temperature and regular exercise in the open air can be secured without foregoing the comforts of home and the satisfaction of family intercourse. Some of my patients have pursued this plan with great advantage, and have apparently done better than they would have done in a milder climate, subjected to the discomforts of a boarding-house or hotel life among strangers, and exposed to the baneful influence of constant or frequent contact with invalids.

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Blood Gas Corner #25— The Patient is Confused: Are You? Coma and Dehydration in an Alcoholic Patient

Kevin L Ferguson MD

A 47-yr-old, white man was brought by paramedics to the emergency room after having been found lying unresponsive in the hallway of his apartment building. An intravenous (I.V.) line had been established in the field and naloxone (Narcan), thiamine, and 50% dextrose had been given (the standard field protocol in this area of the country for coma of unknown origin); but little change in mental status had resulted.

On arrival in the emergency room the patient could give no history, but with identification and subsequent record retrieval it became known that he was an alcoholic who had been admitted in the past to a nearby hospital for an upper gastrointestinal (GI) bleed and 5 months previously to our hospital in similar coma. Physical examination revealed a patent airway, a spontaneous respiratory rate of 10 breaths/min, a blood pressure of 100/60, and a regular pulse of 80 beats/min. He was unresponsive to noxious stimuli. A fresh abrasion was evident on the bridge of his nose, but no other evidence of head or neck trauma was present. The oral mucosa was dry, and the pupils were equal and reactive. As consciousness returned, his speech was slurred and inappropriate; he was oriented only to self, and he was agitated and combative. No focal deficits were apparent; and except for severely decreased skin turgor and mild clubbing of the digits, the results of the rest of the examination were unremarkable.

The analysis of arterial blood drawn while the patient breathed room air revealed: pH 7.62, P_{aCO_2} 56 torr [7.46 kPa], P_{aO_2} 43 torr [5.73 kPa], HCO_3 60 mEq/L [60 mmol/L], BE 28 mEq/L [28 mmol/L], S_{aO_2} 88%.

The patient was placed on 40% oxygen by face mask and consequently the S_{aO_2} increased to $> 90\%$. Results of a tomographic scan of the head were within normal limits. The patient's ethanol level was only 70 mg/dL [15 mmol/L] (legal limit for driving is $<$ 80 mg/dL [$<$ 17 mmol/L], toxic level is $>$ 100 mg/dL [$>$ 22 mmol/L]).[1] His plasma lactate level was 13.4 mEq/L [13.4 mmol/L] (reference interval is 0.5-2.5 mEq/L [0.5-2.5 mmol/L]).[1]

Study Questions

1. What do the blood-gas values show?
2. What would you expect a blood chemistry report to show?
3. How would you rehydrate this patient?
4. Is there any specific therapy for this patient's problem?
5. What is the probable cause of this patient's illness?
6. Does this patient have lactic acidosis? Why or why not?

Answers and Discussion on next page

Dr Ferguson is a Critical Care Fellow, Department of Emergency and Critical Care, SUNY Health Science Center, Syracuse, New York.

Answers and Discussion

1. **Blood gas values.** The blood gas report clearly demonstrates a metabolic alkalosis with attempted respiratory compensation (by hypoventilation) to the point of moderate hypoxemia.

The chemoreceptors in the brain respond to an alkaline pH by inducing hypoventilation.[2] However, compensation by hypoventilation is limited because of the effect of hypoxia on respiratory drive. Although the P_{aCO_2} increases 0.6-0.7 torr [0.08-0.09 kPa] for each 1.0 mEq/L [1.0 mmol/L] increase in the plasma bicarbonate (HCO_3^-),[2] hypoxia triggers the ventilatory drive at $P_{aO_2} < 60$ torr [8.00 kPa]. The P_{aO_2} falls 1.25 torr [0.17 kPa] for every 1.0 torr [0.13 kPa] increase in the P_{aCO_2}, and the hypoxic drive counters the hypoventilatory response to maintain a $P_{aCO_2} \geqslant 60$ torr [8.00 kPa].[2] A $P_{aCO_2} > 60$-65 torr [8.00-8.66 kPa] suggests the existence of another cause of hypoventilation. When compensation by hypoventilation is overwhelmed, the body's next response is to 'dump' HCO_3^- in the urine.

2. **Blood chemistry results and implications.** The results of the patient's blood chemistry report are shown in Table 1. Because of this patient's dehydration, his kidney's obligation to conserve volume overrode the need to dump HCO_3^-. Hypokalemia and hypochloremia also contribute to the retention of HCO_3^-, sometimes to the point of producing acidic urine. The presence of acidic urine despite an alkalotic extracellular fluid (ECF) indicates a severe hypokalemia. Treatment of the alkalosis will not be effective unless the hypokalemia is also treated.[2]

3. **Hydration management.** The degree of dehydration apparent in this patient represents a greater than 10% loss of total body water.[2] Patients who are volume depleted release large amounts of aldosterone that induce the kidneys to conserve volume, secrete H^+ and K^+ into the urine, and reabsorb HCO_3^- in the kidneys (perpetuating the metabolic alkalosis).[2,3] Initial fluid therapy is directed toward expanding the vascular compartment and replacing chloride and potassium ions—thereby increasing renal excretion of HCO_3^-.[2,4] The patient received 0.9% NaCl and KCl solutions to replete the intravascular compartment, inhibit renal acid secretion, and promote HCO_3^- secretion.[5] A second infusion of a hypotonic solution of D_5W (5% dextrose) and 0.45% normal saline with supplemental KCl was started as well and infused at 4-8 hours/L to provide free water.

It is important to realize that estimates of the total body K^+ concentration must take the pH and volume status into account.[2] Both acute respiratory alkalemia and metabolic alkalosis increase K^+ and H^+ excretion—apparently by changing the handling of these electrolytes by the distal convoluted tubule of the kidney. Therefore, metabolic alkalosis can lead to kaliuresis and total body potassium depletion.[4] Although a patient this dehydrated probably has a total body K^+ deficit, it is important to appreciate the interactions between the acid-base and K^+ balances because one cannot solve the problems separately.[2,4] Severe hypokalemia can be the cause or the effect of a metabolic alkalosis.[2]

Because a patient such as the one reported is an unreliable historian and at risk for heart disease, a chest radiograph and electrocardiogram (ECG) should be done to look for evidence of heart disease and to determine whether invasive central-circulation monitoring should be used to guide the rehydration.

4. **Appropriate therapy.** Severe metabolic alkalosis is commonly associated with GI or genitourinary (GU) losses of H^+ and increased reabsorption of HCO_3^- (resulting from volume, K^+, or Cl^- depletion).[2,4] It is technically easier to add the acid back than to remove the HCO_3^-. Hemodialysis could correct the blood chemistries but is invasive and risky in a hypovolemic patient. A patient with this degree of metabolic alkalosis is best treated with a HCl infusion that slowly returns the pH toward normal while the patient is being rehydrated. We titrated a drip of 0.1 N solution of HCl (0.1 mol HCl/L solution) to the patient's pH and elected to stop the infusion at a pH of 7.5. This was arbitrarily selected, but it did bring the patient's oxygen-hemoglobin affinity to a reasonable level and avoided overcorrection (ie, inducing an acidosis). Infusions of HCl must be through a central vein.[2]

5. **Probable cause.** The most likely cause of this patient's illness was vomiting and lack of oral fluid intake—secondary to ethanol intoxication. As a general rule, a chloride < 80 mEq/

Table 1. Results of Blood Chemistry Testing

	Actual Patient Values		Reference Intervals[1]	
Na^+	128 mEq/L	[128 mmol/L]	135-147mEq/L	[135-147 mmol/L]
K^+	1.9 mEq/L	[1.9 mmol/L]	3.0-5.0 mEq/L	[3.0-5.0 mmol/L]
Cl^-	50 mEq/L	[50 mmol/L]	95-105 mEq/L	[95-105 mmol/L]
BUN	81 mg/dL	[28.9 mmol/L]	8-18 mg/dL	[3.0-6.5 mmol/L]
creatinine	4.4 mg/dL	[389 μmol/L]	0.6-1.2 mg/dL	[50-110 μmol/L]
glucose	117 mg/dL	[6.5 mmol/L]	70-110 mg/dL	[3.9-6.1 mmol/L]

L [80 mmol/dL] is a result of vomiting or nasogastric (NG) suction.

6. **Presence of lactic acidosis.** Yes. The lack of an absolute acidosis means only that the acidosis is masked by the alkalosis. The elevated lactate level implies there is an ongoing lactic acidosis. When the tissues are deprived of oxygen, anaerobic metabolism is initiated; lactic acid is the end product of glycolysis.[2] The lactic acidosis resulted from decreased tissue oxygen delivery that was caused by a combination of decreased oxyhemoglobin saturation (resulting from hypoventilation) and decreased cardiac output (resulting from hypovolemia). Impaired hepatic gluconeogenesis, a consequence of alcoholism, resulted in diminished lactate utilization by the liver. Alcoholic patients are at greater risk of developing a severe lactic acidosis in the face of increased lactate production.[6]

REFERENCES

1. Young DS. Implementation of SI units for clinical laboratory data: Style specifications and conversion tables. Ann Intern Med 1987;106:114-129.
2. Rosen P, Baker FJ, Braen FR, Dailey RH, Levy RC, eds. Emergency medicine concepts and clinical practice. Vol 2, 1st ed. St Louis: The CV Mosby Co, 1983:1414-1417.
3. Wilson RF. Acid-base balance. In: Tintinalli JE, Krome RL, Ruiz E, eds. Emergency medicine: A comprehensive study guide. 2nd ed. New York: McGraw-Hill Book Co, 1988:35-42.
4. Layon AJ, Kirby RR. Fluids and electrolytes in the critically ill. In: Civetta JM, Taylor RW, Kirby RR, eds. Critical care. Philadelphia: JB Lippincott, 1988:451-474.
5. Kassirer JP, Berkman PK, Lawrenz DL, et al. The critical role of chloride in the correction of hypokalemic alkalosis in man. Am J Med 1965; 38:172-189.
6. Rose BD. Clinical physiology of acid-base and electrolyte disorders. New York: McGraw-Hill Information Services Co, 1989:501-555.

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Conducting Clinical Trials, by Frank L Iber MD, W Anthony Riley MD, and Patricia J Murray BA. Hardcover, 353 pages, illustrated. New York: Plenum Medical Book Company, 1987. $45.00.

This is a guide for the novice clinical investigator who is contemplating becoming involved in sponsored clinical trials. It was written by three authors with extensive experience: research in an academic setting and abundant Institutional Review Board (IRB) work (Dr Iber), medical practice management (Dr Riley), institutional and industrial perspectives (Ms Murray). The book grew out of their collaboration in the expansion of a public contract research firm into the clinical trials market, where little written information was available for guidance of their staff members or investigators. The stated goal of the book is to "provide the new investigator with a solid grounding in basic research procedures that will enable him to successfully execute his first clinical trial." The book deals with the practical details of conducting a clinical trial. It contains examples that illustrate the variety of situations that a clinical investigator may encounter. The authors' extensive experience is reflected in the sound advice offered.

Although a number of books that deal with study design and ethical considerations of research on humans are available, this book provides practical information about performing a successful clinical study. The book does not deal with study design; the assumption is that the reader will be executing a study designed by others—in most cases a pharmaceutical company. Although the basic protocol as presented by a pharmaceutical company to a prospective investigator is developed by experts in the field, the small details that can spell success or failure for a study are not often covered by the company protocol. This book fills in those gaps in an excellent way.

Conducting Clinical Trials is attractively bound, with print and graphics that are pleasing to the eye. It is organized in a logical fashion, so that information can easily be located. The writing is clear and concise. Throughout the book there are numerous well-chosen examples that will be helpful to both novice and experienced investigators. Included in the appendix are completed examples of many of the standard (but complicated) forms that must be completed by investigators and their staff members. Extensive references are provided at the end of each chapter. Sections include: "Entering the Field of Clinical Trials," "The Institutional Review Mechanism," "The Recruitment Process," "Critical Decision Points in a Clinical Trial," "Data Management," "Drug Accountability," and "Enhancing Credibility." Individual sections are well written and informative.

"Entering the Field of Clinical Trials" describes sponsor evaluation, budget planning, and staff selection and training. A particularly excellent discussion of the impact that conducting clinical research has upon the staff, colleagues, and facility is provided as food for thought for groups who are considering becoming involved in conducting clinical trials. Planning a study and estimating its cost are well covered—all of the possible arrangements and costs are considered. Examples of potential pitfalls are excellent, and attention to them may save much time and energy (and may avoid some headaches) for the novice investigator and staff.

"The Institutional Review Mechanism" deals with the IRB in general, and explains the process of evaluating potential risks and benefits to the study subjects. The IRB addresses study appropriateness by considering local standards of care, adequate subject safeguards, and the process of informed consent. This section covers strategies for interacting with the IRB to maximize the chances of a successful review of the study protocol.

"The Recruitment Process" provides good advice on motivating experimental subjects to participate in a study, thus facilitating the process of enrolling study subjects. "Critical Decision Points in a Clinical Trial" describes dealings with so-called special populations (eg, children, prisoners, and the mentally infirm). Other issues addressed include patient compliance with the study, adverse experiences on-study, and other difficulties that may impact on conduct of a study.

"Data Management" describes how to record data to ensure that documentation regulations will be met and confidentiality maintained. Detailed records of patient visits, laboratory specimens, and subject payments are provided as examples. The chapters on study checklists, case report forms, and regulatory document files are excellent and will be helpful to any investigator. "Computer Technology in Data Management" differs from the other chapters in that it is rather vague and makes no specific recommendations regarding hardware or software selection. (I suspect that the authors felt

compelled to include a chapter on computers but had little experience with the subject.)

"Drug Accountability" describes storage and labeling of study drugs, procedures for drug dispensation, drug accountability, and recordkeeping. Special procedures to be followed when studying controlled substances are described in detail. "Enhancing Credibility" covers publication and presentation, prevention of fraud, quality assurance, and FDA inspections. The information presented on fraud is interesting and topical.

In summary, **Conducting Clinical Trials** is a well-written addition to the literature on management of clinical research protocols. There is a great deal of useful information contained within its covers; although the stated intended audience is novice clinical investigators, the book will serve as an excellent resource for more experienced investigators as well. Anyone responsible for conducting clinical research trials (in whole or in part) will find the book useful. Much of the knowledge contained within the book could also be useful to IRB members—indeed, I wish that I had read it prior to my IRB service! In addition, I can envision sponsors of clinical trials who are interested in high quality research giving copies of the book to the centers that will be performing their research trials.

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Manual of Critical Care Procedures, edited by Lyle D Victor MD. Hardcover, illustrated, 215 pages. Rockville MD: Aspen Publishers Inc, 1989. $67.00.

Manual of Critical Care Procedures is an attempt to provide physicians who frequently practice in intensive care units with a guide to surgical procedures that are commonly performed in the critical care setting. This text is valuable because it offers comprehensive descriptions of a variety of procedures in a single volume that are designed with critical care practice in mind. Dr Victor is the Director of the Pulmonary Disease Section of Oakwood Hospital in Dearborn, Michigan, and Clinical Assistant Professor of Medicine at Wayne State University in Detroit. The remaining nine contributors are also physicians associated either with Oakwood Hospital or Wayne State University.

The book is directed toward emergency physicians, surgeons, pulmonary specialists, and critical care specialists. The author explains in the preface that because many physicians who commonly practice in critical care areas have backgrounds in pediatrics or internal medicine, they require additional training in the performance of surgical procedures.

Only two of the text's ten chapters cover techniques that are performed by respiratory therapists—endotracheal intubation and arterial cannulation. However, there are several chapters that may be of interest to respiratory care practitioners who frequently work in adult critical care areas (assisting in or observing a variety of physician-performed procedures). These chapters cover hemodynamic monitoring, thoracentesis, tracheotomy, bronchoscopy, and clinical microbiology. Intensive care nurses may also benefit from the detailed descriptions and illustrations provided in the text.

Each chapter contains excellent photographs and drawings that greatly enhance the material presented in the text. There are frequent, helpful tables that highlight necessary equipment, troubleshooting techniques, and data summaries. The work is well indexed, and thorough bibliographies accompany the comprehensive, detailed chapters. Each chapter provides detailed descriptions of actual procedures along with procedure-specific discussions of indications, contraindications, and complications. Several chapters also include sections on routine care and commonly encountered procedural problems. It should be noted that the book is clearly a guide to *adult* critical care procedures—there are no references to the neonatal or pediatric patient.

I found portions of the reading to be tedious; it is, after all, a procedure manual, but most chapters are easy to follow. Because of its practical nature, Dr Victor's chapter on endotracheal intubation will be particularly helpful to novices. For example, when outlining problems associated with laryngoscopy, Dr Victor offers the following advice: "A small amount of local anesthesia in the posterior pharynx will go a long way to alleviate gagging and retching. If time allows, administering a few squirts of local anesthetic with a curved catheter positioned over the larynx will reduce laryngospasm while the tube is being positioned through the glottis."

Manual of Critical Care Procedures is an excellent resource for the physician who is specializing in adult critical care, or for any physician who is commonly required to perform surgical procedures in the intensive care environment. Its usefulness to the respiratory care practitioner or nurse lies primarily in the familiarization with routine critical care procedures that it provides.

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Quest 2.42 Authoring System, by Allen Communication, 140 Lakeside Plaza II, 5225 Wiley Post Way, Salt Lake City UT 84116. (801) 537-7800. $1,495 ($1,295 for educators). Ten 5¼" floppy diskettes, including the tutorials; two reference manuals; and an installation manual. Available for DOS-based computers only.

An authoring system is a computer software package designed to enable a computer user to develop computer-based instruction (CBI) without going through the difficulties and tedium of computer programming. Those readers who have programmed may appreciate the value of an authoring system just from this brief definition. Those who have not learned programming but would like to author their own CBI should welcome an authoring system that allows them to bypass programming altogether. **Quest** is such a system—and one with extensive features. With it, a nonprogrammer can develop almost any form of CBI including tutorials, simulations, and even interactive videodisc programs.

The Quest package contains three major parts: an authoring component, which includes all of the features for writing lessons; a learning component, which includes the features for presentation to the learner; and a management component, which includes those features necessary for processing information about the learners' interactions with the lessons. An individual lesson is created one frame at a time, much like a slide presentation. Each frame is made up of a combination of objects—text, graphics, audiovisual sequences from a videodisc, computer-generated sound, and branches that lead to subsequent frames.

I have found the development of text presentation to be relatively easy with **Quest**. Text can be varied in color, size, and font. If the standard fonts are inadequate, the character editor for creation of new fonts and special characters can be used. I particularly like the feature that allows text and other objects from one frame to be held over to the next frame to allow the addition of more text or graphics. This allows information to be presented smoothly, one bit at a time, without the need for copying text and graphics to subsequent frames.

Quest provides three ways of developing graphic displays: a 'paint-like' program, a pixel-by-pixel shape editor, and a program for capturing graphic images from other sources. Using the paint program, one can create graphic displays from combinations of lines, circles, rectangles, and arcs. A variety of colors and fill patterns is included. Although this paint program is not as flexible as I would like, it is easy to use. With the shape editor, one builds graphic pictures one pixel, or point, at a time. The shape-editor figures are smaller than I would like, but this shortcoming is compensated for by the animation that is possible. With shape editor, one can draw anatomic features and respiratory therapy equipment and then animate them. For example, it's fairly easy to draw a venturi device and illustrate the dynamics of air entrainment—even clarifying the process with pink air. With the image capture program, one can capture computer graphic images from other programs, import them into lessons, and animate them if desired.

The author decides whether time or some specified condition or response (ie, certain keystrokes, or learner input) will allow the user to advance from one frame to another. The author also selects the conditional branching options. These decisions determine how well the instructional sequence responds to learner input—that is, how interactive it is. **Quest** allows a high degree of interactivity and can analyze and weight and provide feedback for many types of student's answers, using the Quest Performance Objects.

Three programs included with **Quest** manage instruction—controlling who can use the program and for what purpose(s), generating student assignments and providing lists of Quest lessons, and storing data on student progress and performance. Information regarding student performance can be displayed and printed for an individual student and for the group. Lesson reports can also be generated to accumulate information to be used in the evaluation of the lesson itself. A lesson report includes the average amount of time required to complete a frame and the number and percentage of correct responses included in the frame.

Three more features of **Quest** deserve mention: the Quest Authoring Language (QAL), the Quest Text Editor (QED), and the calculator. The QAL is an authoring language that requires a knowledge of computer programming. Although lessons can be generated without programming, courseware authors sometimes find the need for a program to do something that the **Quest Authoring System** cannot bring about. When this situation is encountered, the author may elect to write programs for the desired features. QAL is included for this purpose. The text editor QED can be used to write the code for QAL programs and for disk-operating system (DOS) files. In addition, students can access QED during a lesson for the purpose of note taking. Students can use the calculator for basic mathematic computation during a lesson, and the calculator can also be used as a stand-alone.

Getting started with the development of programs using **Quest** is easy if the prospective author is computer literate. The developmental procedures are logical, and prompt lines provide assistance with all aspects of development; however, I believe that the Help function could be expanded. Allen Communication deserves congratulations for the thoroughness and readability of the manuals and for the effectiveness of the tutorials. Overall, **Quest** is an example of excellence in software,

and I highly recommend it to those who want to develop their own CBI courseware.

The $1,295 price tag for the package may seem exorbitant to some—but I think it a fair price considering the extent of its features. I do have a problem with one particular aspect of the marketing for **Quest 2.42**—the fact that the $1,295 price tag allows the use of **Quest** for development on only one computer within the institution and authorizes only one student learning station. This means that for $1,295 you can write all of the programs you want, but students can legally use only one station. The license for additional student learning stations is $50/station.

Another problem (inherent in authoring systems in general) is that of ownership of programs. If an educator develops a marketable program, the company that owns the authoring system may own a piece of the author's program as well. This is fair enough, but hopeful CBI developer-entrepreneurs should be aware of this legality before trying to market courseware developed with an authoring system.

The upgrade of **Quest 2.42**, **Quest 3.0**, which appeared on the market in January 1990, represents a major rewrite. Among the improvements over earlier versions are context-sensitive help, more fonts, enhanced graphics, generation of a flow diagram for lessons, and more complex animation. **Quest 3.0** authorizes the use of 10 student learning stations. Upgrades can be purchased by current Quest users for $500 or **Quest 3.0** can be purchased by educators for $1,295 ($1,795 for others). An important difference between the upgraded and earlier versions is that **Quest 3.0** supports only EGA, MCGA, and VGA graphics cards, whereas **Quest 2.42** supports CGA, EGA, Master, Tecmar, and Hercules graphics. Therefore, before buying **Quest 3.0**, one should know whether EGA, MCGA, or VGA graphics cards are available for student learning stations. Allen Communications intends to continue production and support of **Quest 2.42** for those who require it.

Educators have long endured the problem of being unable to find textbooks that fulfill all requirements, and have filled in the gaps with handouts of their own. Educational software is no different from the textbooks in this respect. It's hard to find instructional software that does everything that we want it to do. One solution to this problem is to develop courseware, and I believe that with **Quest** the task becomes doable for most educators.

For those interested in developing their own courseware, **The Design, Development, and Evaluation of Instructional Software**, by MJ Hannafin and KL Peck (MacMillan 1988), provides excellent guidance for sound development.

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MenuWorks 2.10, by PC Dynamics Inc, 31332 Via Colinas, Suite 102, Westlake Village CA. 1-800-888-1741, orders only. Requirements: IBM PC, XT, AT, PCJr, PS2, or true PC compatibility, 256K. DOS 2.0 or later, monochrome or color monitor.

The beginner as well as the sophisticated user can avoid computer confusion by using well-designed menu software. A respiratory care department personal computer with a capacious hard drive may have dozens of directories and subdirectories containing quality-assurance, quality-control, wordprocessing, spreadsheet, utility, and computer-assisted instruction (CAI) applications to name a few. In the daily work cycle, the computer may be used variously by the department secretary, billing clerk, blood-gas-laboratory technicians, pulmonary function technicians, quality-assurance specialists, students, and the 'boss.'

Occasionally, an inexpensive product proves to be of superlative quality. I believe that such is the case with **MenuWorks.** Six months ago, I bought this software at a discount house for $16.00 to replace a more expensive, awkward, and terribly slow menu program. In daily use, it has not failed to perform as it should even when working with complex terminate-and-stay-resident (TSR) program stacks! (Such programs often cause menu software to fail because of memory requirements.)

A number of features makes **MenuWorks** one of the best packages available in the commercial marketplace today. When installed, **MenuWorks** immediately recognizes more than 1,000 other software programs and uses a form of artificial intelligence to automatically construct user menus. I did not use this automatic menu construction because so many of my programs are specific to my needs. Menu and submenu development proved to be very easy and such fun to do that I did not really need this feature. **MenuWorks** supports an unlimited number of submenu levels.

I believe the context-sensitive help screens to be truly superior as are the on-disk tutorials. Related areas of help are accessed by monitor-scrolling using a form of hyper-text. The 93-page documentation booklet is helpful, is easy to read, and has a limited index.

The program reportedly works well with multiuser local area network (LAN) systems. Either graded-level or individual password protection is supported—a valuable feature when a computer has a number of users.

At boot-up, a very attractive customized main menu appears on the monitor screen. This menu and the submenus permit up to 81 user selections. If, for some reason, an

interruption of work occurs and a key is not pressed within 5 minutes, a screen saver automatically blanks out the monitor. This feature, of course, prolongs the life of the monitor.

A time-release feature automatically prepares a busy computer for selected program operations at any time, day or night. As an example, if it is customary to enter Level-3 blood-gas-machine control data after midnight each day, **MenuWorks** can ready the computer to receive this data without further user intervention.

It is not necessary to know DOS or to have any programming experience to effectively use **MenuWorks**.

Robert R Weilacher RRT
Director
Respiratory Care Service
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Elliot Hospital

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Letters on topics of current interest or commenting on material in RESPIRATORY CARE will be considered for publication. The Editor may accept or decline a letter or edit it without changing the author's views. The content of letters as published may simply reflect the author's opinion or interpretation of information – not standard practice or the Journal's recommendation. Authors of criticized material will have the opportunity to reply in print. No anonymous letters can be published. Type letter double-spaced, mark it "For publication," and mail to RESPIRATORY CARE Journal, Box 29686, Dallas TX 75229.

Letters

A Call to Physically Handicapped Respiratory Therapists

As a part of my doctoral study at the University of California, Berkeley, I am conducting telephone interviews with physically handicapped respiratory therapists. Each interview lasts 10-20 minutes and consists of questions related to the effect of handicaps on job responsibilities and performance. Anonymity is guaranteed.

If you are a respiratory therapist with a physical handicap and are willing to participate, please contact me by telephone call or letter.

Patrick Pangburn
2532 NE Stanton St
Portland OR 97212
(503) 287-4926

Include your telephone number and indicate the best time for my return call. If you have handicapped colleagues, please advise them of this study and my desire to talk with them.

The purpose of this study is to collate the experiences of therapists and compare and contrast those experiences with the perceptions of educators and managers. I believe that the findings will be useful for recruitment and retention of respiratory therapists.

Patrick Pangburn MS RRT
Respiratory Therapist
Portland, Oregon

Notices

Notices of competitions, scholarships, fellowships, examination dates, new education programs, and the like will be listed here free of charge. Items for the Notices section must reach the Journal 60 days before the desired month of publication (January 1 for the March issue, February 1 for the April issue, etc). Include all pertinent information and mail notice to RESPIRATORY CARE Notices Dept, Box 29686, Dallas TX 75229.

ARCF Literary Award

- The American Respiratory Care Foundation announces a $1000 Literary Award—funded by Radiometer America Inc—for the best case report published in RESPIRATORY CARE from October 1989-December 1990. The winner will be announced on December 8, 1990, at the AARC Annual Meeting, and in the January issue of RESPIRATORY CARE. All case reports will be considered for the Award, and no application is necessary.

AARC SUMMER FORUM

The Registry Resort, Naples, Florida, July 13-15, 1990
The Westin, Vail, Colorado, July 11-13, 1991

AARC ANNUAL CONVENTION SITES & DATES

1990—New Orleans, Louisiana, December 8-11
1991—Atlanta, Georgia, December 7-10
1992—San Antonio, Texas, December 12-15
1993—Nashville, Tennessee, December 11-14
1994—Las Vegas, Nevada, December 12-15
1995—Orlando, Florida, December 2-5

THE NATIONAL BOARD FOR RESPIRATORY CARE

1990 Examination and Fee Schedule

CRTT Examination

EXAMINATION DATE:	JULY 21, 1990
Applications Accepted Beginning:	March 1, 1990
Application Deadline:	May 1, 1990
EXAMINATION DATE:	NOVEMBER 10, 1990
Applications Accepted Beginning:	July 1, 1990
Application Deadline:	September 1, 1990

RRT Examination

EXAMINATION DATE:	JUNE 2, 1990
Applications Accepted Beginning:	December 1, 1989
Application Deadline:	February 1, 1990
EXAMINATION DATE:	DECEMBER 1, 1990
Applications Accepted Beginning:	June 1, 1990
Application Deadline:	August 1, 1990

CPFT Examination

EXAMINATION DATE:	JUNE 2, 1990
Applications Accepted Beginning:	December 1, 1989
Application Deadline:	April 1, 1990

RPFT Examination

EXAMINATION DATE:	DECEMBER 1, 1990
Applications Accepted Beginning:	July 1, 1990
Application Deadline:	September 1, 1990

Fee Schedule

Entry Level CRTT—new applicant:	$ 75.00
Entry Level CRTT—reapplicant:	$ 50.00
Combined RRT Written and Clinical Simulation:	$175.00
Written Registry Only—new applicant:	$ 75.00
Written Registry Only—reapplicant:	$ 50.00
Clinical Simulation Only—new or reapplicant:	$100.00
Entry Level CPFT—new applicant:	$100.00
Entry Level CPFT—reapplicant:	$ 80.00
Advanced RPFT—new applicant:	$150.00
Advanced RPFT—reapplicant:	$130.00
CRTT Recredentialing:	$ 25.00
RRT Recredentialing:	
Written Registry Examination	$ 25.00
Clinical Simulation Examination	$ 65.00
CPFT Recredentialing:	$ 25.00
RPFT Recredentialing:	$ 90.00
Membership Renewal CRTT/RRT/CPFT/RPFT	$ 12.00
Membership Renewal Combination of CRTT/RRT and CPFT/RPFT	$ 18.00

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Not-for-profit organizations are offered a free advertisement of up to eight lines to appear, on a space available basis, in Calendar of Events in RESPIRATORY CARE. Ads for other meetings are priced at $5.50 per line and require an insertion order. Deadline is the 20th of month two months preceding the month you wish the ad to run. Submit copy and insertion orders to: Calendar of Events, RESPIRATORY CARE, PO Box 29686, Dallas TX 75229.

Calendar of Events

AARC & AFFILIATES

April 17-18 in Farmington, Connecticut. The Connecticut Society for Respiratory Care presents "Super Symposium IX" at the Farmington Marriott. Contact Elizabeth Pelletier, PO Box 3256, Enfield CT 06082.

April 18-20 in Des Moines, Iowa. The Iowa Society for Respiratory Care presents its 1990 Iowa Lung Conference at the Hotel Jort Des Moines. Contact Mike Wheeler, (515) 283-6207.

April 18-20 in Osage Beach, Missouri. The Missouri Society for Respiratory Care presents its annual meeting, "Come Cruise With Us" at the Tan-Tar-A resort, Lake of the Ozarks. Keynote speakers are Jerome Sullivan RRT, Joel Cooper MD, and Robert Kacmarek RRT. Contact Jack Dale, (816) 836-8100.

April 21 in New Carrollton, Maryland. The Maryland/District of Columbia Society for Respiratory Care holds a gala event celebrating its 15-year anniversary. "Salute to Excellence" honors 15 previous presidents and the Director and Student of the Year. Contact Chelly Bloomfield RRT, Osler 727, Johns Hopkins Hospital, 600 N Wolfe St, Baltimore MD 21205. (301) 955-5303.

April 25-27 in Sioux Falls, South Dakota. The South Dakota Society for Respiratory Care hosts its annual meeting, "The New Decade—A Survival Kit of the '90s" at the Howard Johnson. Contact Mary Reinesch, (605) 333-6477.

April 29-May 1 in Spokane, Washington. The Washington State Society for Respiratory Care presents the 17th Annual Pacific Northwest Regional Respiratory Care Conference at the Inn at the Park. Specialty presentations include management, pediatric, pulmonary function testing, and critical care topics. Workshops covering the entry-level exam and clinical simulation are planned. Contact Richard Larson, Respiratory Care, Harborview Medical Center, 325 9th Ave, Seattle WA 98104. (206) 223-3316.

May 8-10 in Fontana, Wisconsin. The Wisconsin Society for Respiratory Care presents its annual meeting, "Celebrating 20 years," at the Abbey on Lake Geneva. Contact Tami Hansen RRT, (608) 263-7050.

May 16-18 in Myrtle Beach, South Carolina. Georgia/South Carolina Region VI presents its 14th Annual Conference and Assembly at the Landmark Hotel. Contact Mike Payne, Georgia/South Carolina Region VI, 730 S Pleasantburg Dr, Suite 525, Greenville SC 29607. (803) 879-0200.

May 29-June 2 in Daytona Beach, Florida. The Florida Society for Respiratory Care (FSRC) presents "Sunshine Seminar 1990" at the Daytona Beach Marriott Hotel. Contact FSRC, PO Box 65, Hobe Sound FL 33475-0065.

June 7-8 in Kansas City, Kansas. The Kansas Respiratory Care Society presents its 13th Annual Education Seminar at the Overland Park Marriott. Speakers include Cheryl Brown and Dean Hess. Contact Frank Hart, (913) 676-2175.

June 7-8 in Syracuse, New York. The Central New York Chapter of the New York State Society for Respiratory Care presents its 22nd Annual Seminar, "Respiratory Care: Concepts for the '90s." Thursday, June 7—an afternoon golf tournament is followed by Sputum Bowl competition and a welcome party. Friday, June 8—meeting topics include positive-pressure mask ventilation, aerosol devices and deposition, inverse-ratio ventilation in adults, emergency management of asthma in children, and future directions in respiratory care. Contact Claire Aloan RRT, (315) 478-5920; or Joe Kieffer RRT, (315) 425-7572.

June 13-15 in Roundtop, New York. The New York and New Jersey Societies for Respiratory Care host the 2nd Annual Managers and Educators Conference at the Winter Clove Inn. Contact Patty Bowe, (518) 270-7454 or Ken Wyka, (201) 456-5503.

June 13-15 in St Charles, Illinois. The Illinois Society for Respiratory Care presents its annual convention, "Westward Ho: Golden Opportunities in Respiratory Care," at Pheasant Run. Contact Trudy Watson RRT, Black Hawk College, 6600 34th Ave,

Moline IL 61265, (309) 796-1311, ext 3303; or Vince Madama RRT, Rock Valley College, 3301 N Mulford Dr, Rockford IL 61103, (815) 654-4413 or (815) 654-4410.

June 14-16 in San Diego, California. The California Society for Respiratory Care (CSRC) presents the 1990 Annual Convention, "Pursuing Professional Excellence," at the Sheraton Harbor Island East in San Diego. Contact CSRC, 24307 Magic Mountain Parkway, Suite 288, Valencia CA 91355. (805) 298-4010.

July 30-31 in Reno, Nevada. The Nevada Society for Respiratory Care presents its 4th Annual Symposium at the Flamingo Hilton. Contact Kathy Green RRT, PO Box 2168, Carson City NV 89702. (702) 882-1361, ext 258.

August 24-26 in Marco Island, Florida. The Florida Society for Respiratory Care presents the Southernmost Sandcastle Seminar at the Marco Beach Hilton Resort. Seminar fees cover all Saturday meals including a sunset buffet beach party. Bring your own musical instruments to join our sing-along or win a prize for the "best sandcastle on the beach." Ample time is planned for exhibits. Deadline for reservations is July 12. Contact Dave Robbins RRT, Coral Gables Hospital, 3100 Douglas Rd, Coral Gables FL 33133. (305) 441-6819.

OTHER MEETINGS

April 20-21 in Charlotte, North Carolina. The Carolina/Virginia Society of Critical Care Medicine presents "State of the Art in Critical Care Medicine" at the Adam's Mark Hotel. Program is free to C/VSCCM members. Contact the Society of Critical Care Medicine, (714) 870-5243.

April 20-June 24. Primedica offers preparatory programs for the NBRC examinations in the following cities: Registry Review—Baltimore, Maryland, and Dallas, Texas; Entry-Level Review—Atlanta, Georgia, and Dallas, Texas. Contact Sandy Blair, Primedica, 1841 West Oak Parkway, Suite C, Marietta GA 30062. (800) 647-3729, ext 3139; or (404) 426-0861, ext 3139.

April 27-28 in St Louis, Missouri. The National Flight Paramedics and The National Flight Nurses Association co-sponsor the Mid-Year Air Medical Conference at the Embassy Suites Hotel. Contact conference headquarters. (818) 405-9851.

May 9 in Chicago, Illinois. The Joint Commission on Accreditation of Healthcare Organizations hosts the 3rd National Conference "Peer Review in Today's Health Care Environment." Contact the Joint Commission, 875 N Michigan Ave, Chicago IL 60611. (312) 642-6061.

May 26-29 in Saint John, New Brunswick, Canada. The Canadian Society of Respiratory Therapy presents its 25th Annual Educational Forum and Annual Meeting at the Saint John Trade and Convention Centre. Contact John Unrau, Box 676, Hampton, New Brunswick, Canada E0G 1Z0. (506) 648-6704.

May 30 in Birmingham, Alabama. The Division of Pediatric Pulmonology/Cystic Fibrosis, Department of Pediatrics, University of Alabama at Birmingham co-sponsor "Current Concepts in BPD and CF Management." Contact Virginia Bentley, Pediatric Pulmonary Center, 1600 7th Ave South, Suite 656, Birmingham AL 35233, or call (205) 939-9583.

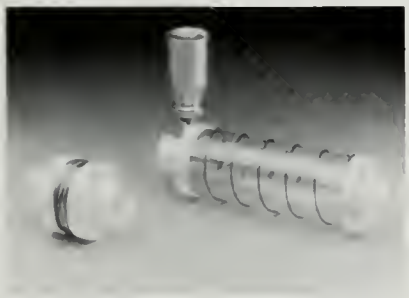
August 30-September 8, Hawaiian cruise aboard the SS Constitution. Dream Cruises' 4th Annual Cruise for Continuing Education presents "Each One, Teach One." Fly to Oahu for two days in Waikiki before boarding ship to four other ports and the islands of Hawaii, Maui, and Kauai. Prices start at $1,215 plus airfare from your gateway city. Write Dream Cruises, 10882 La Dona Ave, Garden Grove CA 92640. 800-462-3628. California residents call (714) 636-2566.

Summer Forum
Naples, FL
July 13-15
Start planning now to bring the whole family and join your RC colleagues on the beautiful beaches of the Gulf Coast of Southwest Florida.

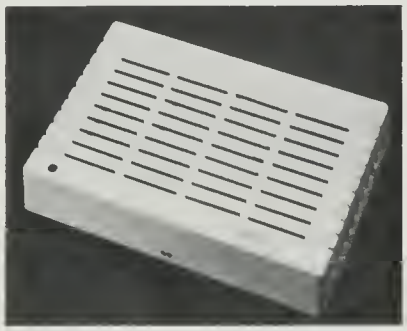
News releases about new products and services will be considered for publication in this section. There is no charge for these listings. Send descriptive release and glossy black and white photographs to RESPIRATORY CARE Journal, New Products and Services Dept, Box 29686, Dallas TX 75229.

New Products & Services

STETHOSCOPES. The MAXI-SCOPE is designed to filter external noises while amplifying heart and lung sounds. According to the manufacturer, MAXI-SCOPE's specially designed head enables breath, heart, and bowel sounds to be quickly and accurately heard through clothing, dressings, and blankets. The MAXI-SCOPE has no moving parts, requires no batteries, weighs 4 oz, is 22 inches long, and can shorten without sound distortion. Other stethoscopes available are the MINI-MAX (for assessing infants 18 months of age) and the MAXI-SCOPE T (for instructional use, equipped with two sets of binaurals). Minuteman Medical Supply Inc, Dept RC, 1503 E Chestnut Ave, Lompoc CA 93436. (805) 735-3402.



AEROSOL HOLDING CHAMBER. The AeroVent Aerosol Holding Chamber is designed to allow delivery of aerosol medications (from an MDI) to mechanically ventilated patients without compromising the integrity of the ventilator circuit. According to the manufacturer, the AeroVent device enhances delivery of aerosol medication to the patient. Because the system remains closed, there is less concern for air discharging or escaping to the environment. The AeroVent device is designed for single-patient use. Monaghan Medical Corp, Dept RC, Franklyn Building, Rte 9 North, PO Box 978, Plattsburgh NY 12901-0978. (518) 561-7330.



CARBON MONOXIDE ALARM. According to the manufacturer, the CO*Star Model 9A-i is the world's first 'biomimetic' carbon monoxide (CO) detector, designed to simulate the human hemoglobin system and its dynamic biochemical reaction with CO and atmospheric oxygen. The CO*Star sensor responds to CO dose, not just the level, which according to the manufacturer sets it apart from earlier technology because it is able to ignore harmless fluctuations in CO level as well as other household fumes. The CO*Star is designed to offer the security of knowing that combustion appliances are working properly and to provide extra protection from combustion accidents during which smoke alarms are not adequate. The CO*Star is powered by a 9-volt battery, is easily installed with 2 screws, and costs less than $90 delivered. Quantum Group Inc, Dept RC, 11211 Sorrento Valley Rd, Suite D, San Diego CA 92121. (800)-432-5599.

NEONATAL RESUSCITATOR. According to the manufacturer, the NeoVO$_2$R resuscitator allows preselected volumes to be delivered to a neonate consistently and repetitively and protects against hazards such as hyperinflation of the lungs, hyperventilation, and inconsistent F_{IO_2} delivery. A known volume of gas is displaced from the cylindrical chamber of the NeoVO$_2$R into the patient breathing circuit; volume can be changed by adjusting the piston in the graduated cylinder. Sechrist Industries Inc, Dept RC, 2820 Gretta Lane, Anaheim CA 92806. (714) 630-2400.

ACLS VIDEOTAPES. According to the manufacturer, this set of nine ½-

inch VHS videotapes covers all topics necessary for Advanced Cardiac Life Support (ACLS) certification or recertification; it includes both the 'core' and 'supplemental' curricula of the American Heart Association. The ACLS copyrighted series includes 5½ hours of information, a review booklet, and a warranty. A preview tape can be obtained from the manufacturer. Also available is a Pediatric Advanced Life Support (PALS) preparatory program. Armstrong Medical Industries Inc, Dept RC, PO Box 700, Lincolnshire IL 60069-0700. (800) 323-4220, or (708) 913-0101 in Illinois.

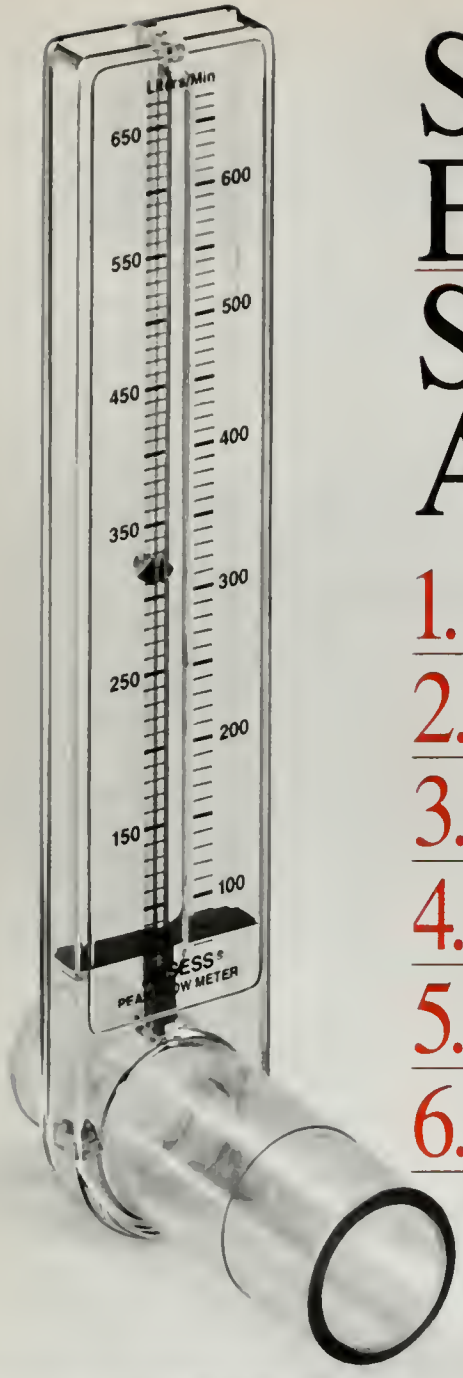
V_{O_2} MEASUREMENT BY TELEMETRY. According to the manufacturer, the K2 System is the first instrumentation package that permits measurement of O_2 consumption and ventilation during any sport or activity. The subject wears a lightweight facemask (with a built-in turbine flowmeter) and carries a miniature oxygen analyzer (with dynamic micro mixing-chamber [DMC]) in a chest- or backpack. The DMC is electronically controlled to optimize the dynamics of the sampling pump in relation to instantaneous flow and ventilation; and the system employs an open circuit that requires only a capillary tube to aspirate the gas. The portable unit is protected by a shock resistant case, and is powered by a rechargeable battery. According to the manufacturer, the signal encoding system allows transmission of physiologic measurements as far as 600 m from the receiver; during the test the receiver stores and prints real-time data pertaining to heart rate, minute ventilation ($\dot{V}_E$), respiratory rate, tidal volume, oxygen consumption ($\dot{V}_{O_2}$), relative $\dot{V}_{O_2}$ per kg of body weight, and $\dot{V}_E/\dot{V}_{O_2}$. The stored data is downloaded to an IBM-type PC for management and graphic presentation. A free datasheet is available. Vacumetrics Inc/Vacumed Division, Dept RC, 5770 Nicolle St, Ventura CA 93003. (805) 644-7461.

OXYGEN ANALYZER-MONITOR. The VTI Oxygen Analyzer-Monitor is designed for either continuous monitoring or for spot-check analysis. VTI features include: indicators for both low battery and sensor disconnect, adjustable high and low alarms (with visual LED and audio indicators), automatic temperature compensation, portable 9-volt battery operation, and a large digital display. According to the manufacturer, the VTI is the only oxygen analyzer-monitor that allows use of either polarographic or galvanic sensors. Vascular Technology Inc, Dept RC, 25 Industrial Ave, Chelmsford MA 01824. (508) 250-0856.

VALVED T-ADAPTER. According to the manufacturer, this new T-adapter, designed with a one-way valve, eliminates the need to disconnect the mechanical ventilator circuit when attaching a medication nebulizer; thus reducing the potential for pressure loss, contamination, and patient discomfort. Baxter Healthcare Corporation, Dept RC, PO Box 590, Valencia CA 91355-8900. (805) 253-7501.

Just Call Us . . .

The AARC staff in Dallas is always ready to help members find answers to their questions. The Executive Office contains a repository of information about many different issues affecting the respiratory care profession. So, just call us at (214) 243-2272.



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References 1. Hendler J, Shapiro S, Ogirala R, Aldrich T. Accuracy of new and used portable peak flow meters. Abstract presented at the 46th Annual Meeting of the American College of Allergy and Immunology, Orlando, FL, November 11–15, 1989. 2. Shim CS, Williams MH. Relationship of wheezing to the severity of obstruction in asthma. *Arch Intern Med 143* 890, 1983. 3. Williams MH. Expiratory flow rates: Their role in asthma therapy. *Hospital Practice* 95, October, 1982. 4. Woolcock AJ, Yan K, Salome CM. Effect of therapy on bronchial hyperresponsiveness in the long-term management of asthma. *Clinical Allergy 18* 165, 1988

Circle 99 on reader service card

Bright Horizons in Respiratory Care

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The COPD Patient in Trouble, Professor's Rounds — April 20
by David J. Pierson MD, Dean Hess MEd RRT

Use of Aerosols in Respiratory Care, Lecture and Discussion — June 1
by Dean Hess MEd RRT, Rob Chatburn RRT

Respiratory Problems Following Trauma, Professor's Rounds — September 14

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Call for Abstracts

RESPIRATORY CARE
OPEN FORUM
1990 AARC ANNUAL MEETING

The American Association for Respiratory Care and its science journal, RESPIRATORY CARE, invite submission of brief abstracts related to any aspect of cardiorespiratory care. The abstracts will be reviewed, and selected authors will be invited to present papers at the Open Forum during the AARC Annual Meeting in New Orleans, Louisiana, December 8-11, 1990. Accepted abstracts will be published in the November 1990 issue of RESPIRATORY CARE. Membership in the AARC is not necessary for participation.

Specifications

Please Read Carefully

An abstract may report (1) an **original study**, (2) the **evaluation of a method or device**, or (3) a **case or case series**. Topics may be aspects of adult acute care, continuing care/rehabilitation, perinatology/pediatrics, cardiopulmonary technology, health occupations education, or management of personnel and health-care delivery. The abstract may have been presented previously at a local or regional—but not national—meeting and should not have been published previously in a national journal.

The abstract will be the only evidence by which the reviewers will decide whether the author should be invited to present a paper at the Open Forum. Therefore, *the abstract must provide all important data, findings, and conclusions.* Give specific information. Do not write such general statements as "Results will be presented" or "Significance will be discussed."

Essential Content Elements

An **original study** abstract ***must*** include (1) Introduction: statement of research problem, question, or hypothesis; (2) Method: description of research design and conduct in sufficient detail to permit judgment of validity; (3) Results: statement of research findings with quantitative data and statistical analysis; (4) Conclusions: interpretation of the meaning of the results.

A **method/device evaluation** abstract ***must*** include (1) Introduction: identification of the method or device and its intended function; (2) Method: description of the evaluation in sufficient detail to permit judgment of its objectivity and validity; (3) Results: findings of the evaluation; (4) Experience: summary of the author's practical experience ***or*** a notation of lack of experience; (5) Conclusions: interpretation of the evaluation and experience. Cost comparisons should be included where possible and appropriate.

A **case report** abstract ***must*** report a case that is uncommon or of exceptional teaching/learning value and must include: (1) case summary and (2) significance of case. Content should reflect results of literature review. The author(s) should have been actively involved in the case and a case-managing physician must be a co-author or must approve the report.

Abstract Format and Typing Instructions

An optical scanner will be used to process abstracts. ***Do not use a dot-matrix printer.*** First line of abstract should be the title. Title should explain content. Type the abstract ***double-spaced*** on ***plain white bond paper***, on ***one page*** only (copier bond is excellent). Do not underline or boldface and insert only one letter space between sentences. Provide a 1-inch margin top and bottom, a 1/2 inch left margin, and an approximate 1/2 inch ragged right margin.

No identification of authors or institutions is to appear on the abstract sheet or in the abstract itself. Make the abstract all one paragraph. Data may be submitted in table form ***provided the table width is limited to 60 letter spaces*** (ie, letters or numbers plus necessary blank spaces = 60). ***No*** figures or illustrations are to be attached to the abstract.

Type all information required to complete the author information form on the other side of this page. A photocopy of good quality may be used.

Standard abbreviations may be employed without explanation. A new or infrequently used abbreviation should be preceded by the spelled-out term the first time it is used. Any recurring phrase or expression may be abbreviated if it is first explained.

Check the abstract for (1) errors in spelling, grammar, facts and figures; (2) clarity of language; (3) conformance to these specifications. An abstract not prepared as requested may not be reviewed.

Questions about abstract preparation may be telephoned to the editorial staff of RESPIRATORY CARE at (214) 243-2272.

Deadlines

The mandatory Final Deadline is June 9 (postmark). Authors will be notified of acceptance or rejection ***by letter only***—to be mailed by August 15.

Authors may choose to submit abstracts early. Abstracts received by March 26 will be reviewed and the authors notified by May 1. Rejected abstracts will be accompanied by a written critique that should in many cases enable authors to revise their abstracts and resubmit them by the final deadline (June 9).

Mailing Instructions

Mail 1 copy of the abstract, 1 author information sheet, and a stamped, self-addressed postcard (for notice of receipt) to:

RESPIRATORY CARE
PO Box 29686
Dallas TX 75229

1990 OPEN FORUM
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Please type:

Abstract title

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Institution

Please include authors' credentials.

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Mail, with abstract and stamped self-addressed postcard, to RESPIRATORY CARE Open Forum
PO Box 29686, Dallas TX 75229

RESPIRATORY CARE

Instructions for Authors and Typists

These Instructions are meant to guide authors and typists, including veterans in those roles, in the production of quality manuscripts. Perfection is not expected, but the well-prepared manuscript has the best chance for prompt review and early publication.

General Requirements

Submissions should (1) be related to respiratory care, (2) be planned for one of the publication categories below, and (3) be prepared as indicated in these Instructions. A letter accompanying the manuscript must specify the intended publication category, be signed by all the authors, and, when there are two or more authors, state that "We, the undersigned, have all participated in the work reported, read the accompanying manuscript, and approved its submission for publication."

Publication Categories

Research Article (Study): A report of an original investigation.
Evaluation of a Device/Method/Technique: A description and evaluation of an old or new device, method, technique, or modification.
Case Report: A report of a clinical case that is uncommon or of exceptional teaching value. The author(s) must have been associated with the case. A case-managing physician must be one of the authors or, if not an author, must supply a letter approving the manuscript.
Case Series: Like a Case Report but including a number of cases.
Review Article: A comprehensive, critical review of the literature and state of the art of a pertinent topic that has been the subject of 40 or more published research papers.
Overview: A critical review of a pertinent topic about which not enough research has been published to merit a Review Article.
Update: A report of subsequent developments in a topic that has been critically reviewed (not necessarily in this journal).
Point of View: A paper expressing the author's personal opinions on a pertinent topic.
Special Article: If a paper does not fit one of the foregoing categories but is pertinent, the editors may consider it as a Special Article.
Editorial: A paper that draws attention to a pertinent concern.
Letter: A signed communication about material published in this journal or on topics of interest or value to readers.
Blood Gas Corner: A brief, instructive case report (real or fictional) involving invasively or noninvasively obtained respiratory care blood data, followed by questions for readers—with answers and discussion.
PFT Corner: Like Blood Gas Corner but involving pulmonary function testing.
Test Your Radiologic Skill: Like Blood Gas Corner and PFT Corner but involving pulmonary-medicine radiography and including one or two 4 × 5 or 5 × 7 inch prints of radiographs. The case must be real.
Review of Book, Film, Tape, or Software: Anyone interested in writing a review can discuss it with an editor.

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Authors are urged to obtain the RESPIRATORY CARE Author's & Typist's Kit. The Kit provides *authors* with specific guidance about writing a research paper, writing a case report, converting to and from SI units, and in-house manuscript review. *Typists* can use the Kit's Model Manuscript, a list of journal name abbreviations, and a copy of these Instructions. The Kit is free from the Journal office.

Preparing the Manuscript

General Concerns—*Typist*

- Double-space ALL lines, including those in references, figure legends, and tables. Do not justify right margins.
- Number pages in upper right corner and leave margins of 1½" or more on all four sides of the page.
- For research articles, follow format of Model Manuscript, Respir Care 1984;29:182 (Feb 1984).
- Meticulously follow instructions for typing references.

General Concerns—*Author:*

- Structure manuscript as specified hereafter.
- Provide all requested information on title page as specified hereafter.
- Proofread manuscript for completeness, clarity, grammar, spelling; be sure all references, figures, and tables are cited in the text.
- Consider having paper reviewed in-house before submission.
- Have all co-authors proofread and approve manuscript and sign submission letter.

Manuscript Structure

Most kinds of papers have standard parts in a standard order. However, papers can vary individually, and not every paper will have all the parts listed here.

Research Article: Title page, abstract page, continuous text (Introduction, Materials & Methods, Results, Discussion), Product Sources page, Acknowledgments page, references, tables, figure legends. Please consult "Writing a Research Paper," Respir Care 1985;30:1057 (Dec 1985) and Model Manuscript, Respir Care 1984;29:182 (Feb 1984).
Evaluation of Device/Method/Technique: Title page, abstract page, continuous text (Introduction, Description of Device/Method/Technique, Methods of Evaluation, Results of Evaluation, Discussion), Product Sources page, Acknowledgments page, references, tables, figure legends.
Case Report or Case Series: Title page, abstract page, continuous text (Introduction, Case Summary, Discussion), Acknowledgments page, references, tables, figure legends. Also see "How To Write a Better Case Report," Respir Care 1982;27:29 (Jan 1982).
Review Article: Title page, Table of Contents page, continuous text (Introduction, History, Review of Literature, State of the Art, Discussion, Summary), references. May include figures & tables. No abstract. Table of Contents optional. Other formats may be appropriate.
Overview, Update, Point of View, or Special Article: Title page, text (introduction, message), references, tables, figure legends. No abstract.
Letter: Title page (provide a title), text, writer's name & affiliation, references. Tables & figures may be included. Double-space everything. Write "For Publication" on title page.

Structure: Important Details

Title Page: List title of paper, all authors' full names, degrees, credential letters, professional positions, and affiliations. List correspondence address, telephone number, and reprint address if desired. Name sources of grants or other support. Identify any author's consulting or commercial relationships that pertain to the paper's topic.

Abstract Page: Number this Page 1. List paper's title but omit authors' names. Abstract should be 200 words or less and must be informative, briefly specifying main points of paper, such as methods, results, and conclusions drawn.

Statistical Analysis: In research articles, identify statistical tests and chosen level of significance in the Methods section. In Results section, report actual P values.

Figures (illustrations): All photographs, diagrams, & graphs must be numbered as Figure 1, Figure 2, etc, according to the order in which each is first mentioned in the text. Photographs must be glossy prints 5 × 7 to 8 × 10 inches and should be black & white unless color is essential. Letters and numerals must be neat and large enough to remain legible if figure is reduced in size for publication. Final figures must be of professional quality, but 'rough' sketches may accompany the submitted manuscript, with final figures to be prepared after review. Identify each figure on back with a stick-on label showing figure number and arrow indicating top; omit author's name. Cover label with clear tape so ink will not smudge other prints. Supply three sets of unmounted figures. If figure has been published before, include copyright-holder's written permission to use it.

Figure Legends: List figure legends on a separate page, not on figures. If a figure has been published before, list the source in the legend.

Tables: Type each table on a separate page. Avoid more than 8 columns across. Continue a deep table on following pages. Give each table a number and descriptive title, placed above the table. Double-space ALL lines in tables, including column headings and footnotes.

Drugs: Brand names may be given, but always also show generic names.

Units of Measurement: In addition to conventional units of measure, show SI values and units in brackets after conventional expressions: ie, "PEEP, 10 cm H_2O [0.981 kPa]." For conversion to SI, see RESPIRATORY CARE 1988;33:861-873 (Oct 1988).

Commercial Products: If three or fewer commercial products are named in the text, list the manufacturer's name and location in parentheses the first time each is mentioned. If four or more products are named, do not list manufacturers in the text; instead, name the products and manufacturers in a Products Sources list at the end of the text. Provide model numbers when available.

Abbreviations: Use an abbreviation only if the term occurs several times in the paper. Write out the full term the first time it appears, followed by the abbreviation in parentheses. Thereafter, employ the abbreviation alone. Never use an abbreviation without defining it. Do not create new abbreviations unless absolutely necessary.

References:

- Use references to support statements of fact, indicate sources of information, or guide readers to further pertinent literature.
- Cite only published works—or works accepted for publication. When listing an accepted but still unpublished work, designate the accepting journal's name, followed by "(in press)."
- In the text, cite references by superscript numerals (half space above text), not in parentheses. The first reference cited in the text is number 1, the next is number 2, etc.
- In the reference list, place the cited works in numerical order.
- For the reference list, obtain author names, article and book titles, dates, volume and page numbers from the *original* cited articles and books, not from secondary sources such as other articles' reference lists, which often are inaccurate.
- Type references in medical-journal style. Examples appear at the end of these Instructions. Abbreviate journal names as in *Index Medicus*. A list of many journal-name abbreviations was published in Respir Care 1988;33:1050 (Nov 1988).
- DOUBLE-SPACE the lines of references.
- List ALL authors' names. Do not use "et al" to substitute for names.
- Identify abstracts, editorials, and letters as such. See examples.

Personal Communications, Unpublished Papers, and Unpublished Observations: List unpublished items in parentheses in the text, not in the reference list.

Examples of How To Type References

Notes: Although the examples here are printed with single-spaced lines, please double-space references in manuscripts. Also, note that words in article and book titles are not capitalized—except proper names.

Standard Journal Article:

1. Shepherd KE, Johnson DC. Bronchodilator testing: An analysis of paradoxical responses. Respir Care 1988;33:667-671.

Corporate Author Journal Article:

2. American Association for Respiratory Care. Criteria for establishing units for chronic ventilator-dependent patients in hospitals. Respir Care 1988;33:1044-1046.

Article in Journal Supplement:

(Journals differ in their methods of numbering and identifying supplements. Supply sufficient information to allow retrieval.)

3. Reynolds HY. Idiopathic interstitial pulmonary fibrosis. Chest 1986;89(3, suppl):139s-143s.

Abstract in Journal:

(Abstracts are not strong references; when possible, full papers should be cited. When cited, abstracts should be identified as such.)

4. Lippard DL, Myers TF, Kahn SE. Accuracy of pulse oximetry in severely hypoxic infants (abstract). Respir Care 1988;33:886.

Editorial in Journal:

5. Rochester DF. Does respiratory muscle rest relieve fatigue or incipent fatigue? (editorial). Am Rev Respir Dis 1988;138:516-517.

Letter in Journal:

6. Smith DE, Herd D, Gazzard BG. Reversible bronchoconstriction with nebulised pentamidine (letter). Lancet 1988;2:905.

Personal Author Book:

7. Nunn JF. Applied respiratory physiology. New York: Appleton-Century-Crofts, 1969.

Note: To specify pages cited in a book, place a colon after the year and then list the page(s). Examples: 1969:85 (one page), 1963:85-95 (series of contiguous pages), 1963:85,95 (separated pages).

Corporate Author Book:

8. American Medical Association Department of Drugs. AMA drug evaluations, 3rd ed. Littleton CO: Publishing Sciences Group, 1977.

Book with Editor, Compiler, or Chairman as 'Author':

9. Guenter CA, Welch MH, eds. Pulmonary medicine. Philadelphia: JB Lippincott, 1977.

Chapter in Book:

10. Pierce AK. Acute respiratory failure. In: Guenter CA, Welch MH, eds. Pulmonary medicine. Philadelphia: JB Lippincott, 1977:171-223.

Submitting the Manuscript

After preparing the manuscript according to these Instructions, perform a final proofreading and check for accuracy and completeness. Then mail three copies of the manuscript and three sets of figures to RESPIRATORY CARE, PO Box 29686, Dallas TX 75229 (or Federal Express to RESPIRATORY CARE, 11030 Ables Lane, Dallas TX 75229). Manuscript copy on IBM-compatible or Macintosh disks in addition to the requisite three hard copies will facilitate processing (Macintosh preferred). Enclose a letter as specified under **General Requirements** at the beginning of these Instructions. Do not submit material that has been published or is being considered elsewhere.

Author's Checklist

1. Is paper for a listed publication category?
2. Does cover letter meet specifications?
3. Is title page complete?
4. Are all pages double-spaced and numbered?
5. Are all references, figures, and tables cited in the text?
6. Are references typed in requested style?
7. Have SI values been provided?
8. Has all arithmetic been checked?
9. Has manuscript been proofread by all authors?

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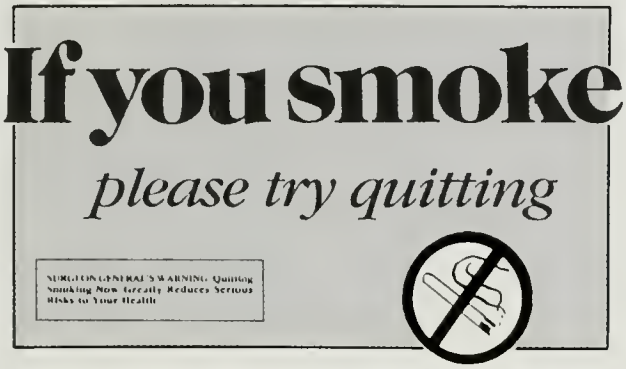
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D ☐ Staff Technician
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